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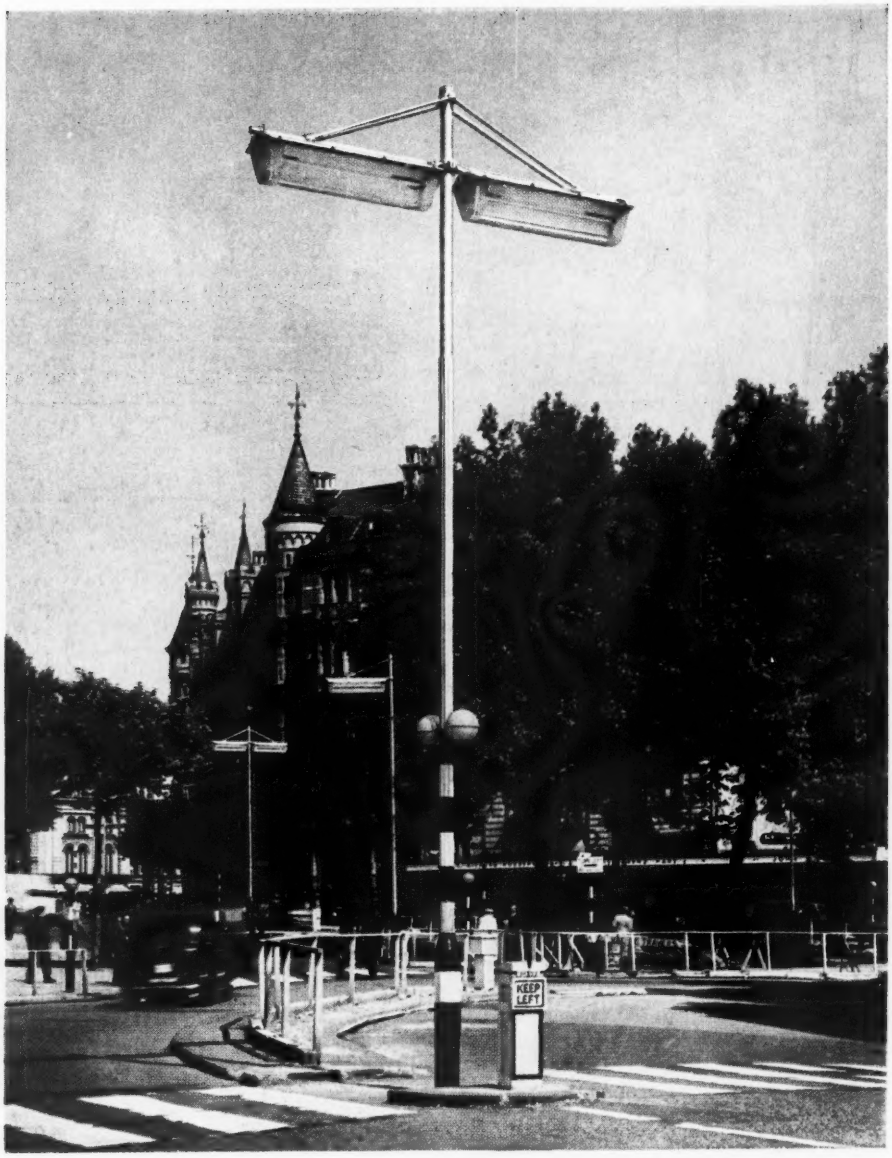

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ELECTRICAL REVIEW

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25 FEBRUARY 1955

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137 CLASSIFIED ADVERTISEMENTS
135 REGIONAL GUIDE TO ELECTRICAL CONTRACTORS
150 INDEX TO ADVERTISERS

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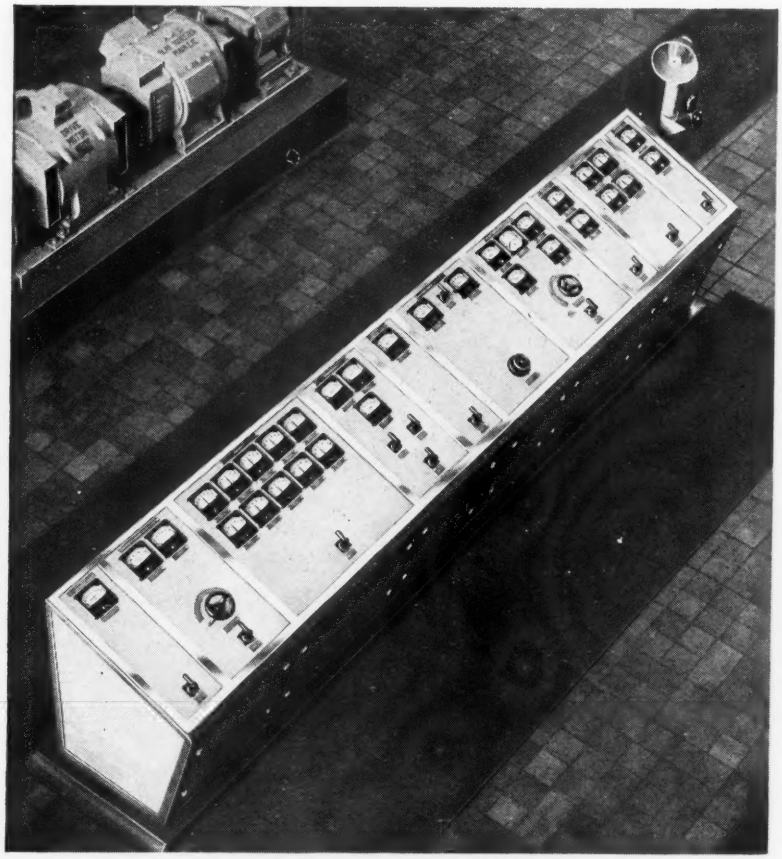

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ELECTRICAL REVIEW

25 February 1955 Vol. 156 No. 8 Established 1872

The New Industrial Revolution

DEFINITE shape has been given to proposals to use nuclear fission as a source of power in Britain by the publication of the Government White Paper which was summarized by us last week and is dealt with further in this issue. Developments in this direction, at home and abroad, have been described stage-by-stage in this journal up to the early constructional stages of the prototype generating station at Calder Hall. The project now to be put in hand is the first of its kind in the world; the need having created the will for it, the means will be provided.

The description applied to this use of atomic energy, by the Minister of Fuel and Power (Mr. Geoffrey Lloyd), as the harbinger of a second industrial revolution does not appear to overstrain its potentialities. Just as the first industrial revolution was based on the burning of coal to raise steam for driving the engines—the outcome of the inventiveness of Newcomen and Watt, so the new dispensation in its latent possibilities of increasing industrial prosperity will depend upon the production of heat in reactors designed in this country for driving turbo-alternators, which the world owes to another Englishman, Sir Charles Parsons, since the only known way of using the results of nuclear fission is in the form of electricity distributed in the ordinary way.

The decision to start with the most practicable type of reactor available is a wise one in view of the immediacy of the need to relieve the drain on colliery output. Such questions as whether liquid cooling might later prove superior to gas cooling as initially adopted and whether means can be devised of economically superheating the steam produced to the temperatures necessary to secure the better thermal efficiencies of modern coal-fired power stations (on which we commented in our issue of 11th February) can very well await the solution of the complex technical problems they entail. What is essential is that working experience of the new techniques should be gained immediately by engineers who will manufacture and operate full-scale plants.

Another matter, to which we have previously drawn attention, is that the practical knowledge thus gained is likely to provide a new export trade in the supply of reactors to other countries, which would tend also to stimulate orders for the accompanying electrical plant. The long time that has so often intervened between a scientific discovery and its commercial application cannot now be permitted. To reap the fruits of being first in the commercial field calls for a maximum of " drive " simulating a wartime effort. The informed enthusiasm evident on the part of the Minister of Fuel and Power and the closeness of collaboration between those most closely concerned in carrying out the Government policy, as represented by Sir John Cockcroft, Sir Christopher Hinton and Lord Citrine, and also by the manufacturing companies, are clear enough indications that the effort required over and above that already found in the scientific and technological fields will be forthcoming.

BOARDS AND CONTRACTORS

By this time members of the Electrical Contractors' Association should be convinced that the Electricity Boards mean them no harm. Once again they received as assurance from Mr. J. Eccles, who as well as being this year's President of the Institution of Electrical Engineers is a deputy-chairman of the British Electricity Authority and until recently was chairman of an Electricity Board. Speaking at last week's annual dinner of the Association, Mr. Eccles said that although the Boards did "a certain amount" of electrical installation work, their activities as sellers of electricity created a sufficient volume of work not only to keep their own installation departments busy but also to give the private contractors plenty to do. Further co-operation between the two parties is foreshadowed by the pending establishment of a National Inspection Council. This move will strengthen the position of the genuine electrical contractor; although it will fall short of the compulsory registration desired by the E.C.A., the new system should rid the industry of the "kerbstoner"—long a bugbear of E.C.A. members. So, it seems, the E.C.A. need not regard the activities of the Electricity Boards with suspicion, or fear the "smile on the face of the tiger."

FUTURE OF WATER POWER

When the atomic power plans were announced last week it was emphasized that nuclear energy would only supplement, and not replace, other forms of "fuel"—under which comprehensive heading are included water and wind power as well as coal and oil. Though this country's water power resources are comparatively limited, their development where economically feasible is essential to meet the rapidly growing demand for electricity in industry, agriculture and the home. In the area of the North of Scotland Hydro-Electric Board, whose report for 1954 is reviewed in this issue, the provision of supplies to the widely scattered rural communities on favourable terms would have been impossible without the harnessing of the Highland's water power resources. Mr. Thomas Lawrie, the Board's general manager, has pointed out that, far from any reduction, the White Paper on nuclear power generation envisages a tenfold expansion in water power development in the next twenty years. The main effect will be to place more emphasis on pumped storage, permitting hydro-electric stations to cover peak load requirements with nuclear plant taking care of the base load.

MACHINES AND MEN

On the B.B.C. programme "At Home and Abroad" last week a recording of an interview between Pandit Nehru, Prime Minister of India, and an American journalist was presented. The Prime Minister was asked whether successful results had been achieved by a scheme whereby many young Indians went to America for technical training of various sorts. Pandit Nehru said that, although India was in very great need of technologists, there was another side to the question. He had noticed that many of these trained men, after their return to their own land, were left without the machines in connection with which they had been trained. During a tour of sections of the English Electric Co.'s works at Stafford last week we saw many equipments in the course of manufacture—switch and control boards, transformers, hydro-electric sets, etc.—labelled for backward and undeveloped countries, indicating that the electrical manufacturing industries of the advanced countries of the world are making an all-out effort to serve the undeveloped countries. At the same time, in the highly developed countries where the tools are available there is a serious dearth of adequately trained technologists. Men are being trained and the tools are being made as fast as possible and eventually there will be some sort of equilibrium.

COST AND USE OF COMPUTERS

The articles on electronic computers in last week's issue and this (Ferranti, Ltd., and the English Electric Co., Ltd.) focus attention on particular aspects of the development. It has been asked whether the computer is economical in view of its high initial cost, and we have heard it said that the field of application of the computer is very limited. But these two aspects are very closely related, and the worth of the computing engine to the customer depends on the extent to which he can use it. It is not so very long since ordinary mechanized accounting was considered as generally too expensive; now it is in almost universal use in large offices. In a somewhat speculative manner Mr. J. K. Brown, director of research, Nelson Research Laboratories, estimated the probable cost of "Deuce" at £50,000, and this, of course, must be related to the field of usefulness. Let us consider one section of this field. Many important problems in engineering reduce to the solution of large sets of linear algebraic simultaneous equations and a large number of these could never be contemplated when using traditional desk computation methods. Many of the problems which have been solved by the computer include the calculation of surge tank oscillations in hydro-electric power stations and of the critical speeds of multi-span shafts for the largest turbo-alternators.

RAILWAY TRACTION

The value of railway electrification in making possible a much fuller employment of rolling stock and a considerable reduction in ancillary works, in addition to saving in fuel, was shown by Mr. F. Q. Den Hollander in his Royal Society of Arts paper (see *Electrical Review*, 11th February, page 213) to have abundantly justified the replacement of steam locomotives in the Netherlands. The choice of systems—the supply of electricity from coal-burning power stations or from diesel generators on the locomotives—was governed by the considerations of traffic density regarded as normal until the possibilities of taking single-phase current from the public supply network recently came to the fore. The greater use of the diesel-electric system forecast for the future appears to be due to the necessity of importing fuel, whether coal or oil, and apparently to an expectation of lower power station thermal efficiencies than those inherent in the British programme.

Nuclear Power Programme

TWELVE STATIONS PLANNED FOR NEXT TEN YEARS

SUPPLEMENTING his statement to the House of Commons on 15th February regarding the issue of the Government White Paper "A Programme of Nuclear Power" (Cmd. 9389, H.M. Stationery Office, price 9d), of which salient particulars were given in the *Electrical Review* of 18th February, the Minister of Fuel and Power (Mr. Geoffrey Lloyd) said at a subsequent conference that he regarded the announcement as the most momentous yet made by any holder of his office. The project it described offered the possibility of a new industrial revolution with a continuing increase in productivity and in living standards.

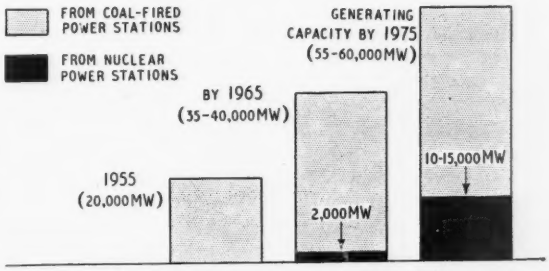
While the secret of nuclear fission had been discovered in 1939, its potentialities as a source of energy had then to be considered solely for war purposes. When Sir Christopher Hinton was appointed in February, 1946, to translate into large-scale engineering terms the new technique discovered and developed by Sir John Cockcroft's team at Harwell, no engineers in Great Britain had any knowledge of atomic energy work.

Progress since then had been so great that the first experimental nuclear power station was already under construction at Calder Hall in Cumberland and the Government, holding that Britain's industrial future depended on speed in applying new techniques, had drawn up a ten-year programme for the building of power stations in which nuclear fission would be exploited on a commercial scale as a source of heat to drive generating plant.

Owing to rapidity of continuing technical developments the programme might be modified, but it was firm enough to give industry something to get its teeth into and to aid in putting this country into the forefront of nuclear development for peaceful uses.

While the cost of the programme was estimated at £300 million, the total expenditure within the ten years would be greater, as the figure mentioned did not cover further stations begun but not completed by 1965. The total amount, however, would be offset by what the British Electricity Authority would otherwise have spent on coal-fired stations of equivalent electrical output. To generate the kWh produced by the twelve nuclear stations would have entailed the burning of between five and six million tons of coal a year.

Looking beyond the present programme, we might by 1975 have nuclear power stations aggregating from ten to

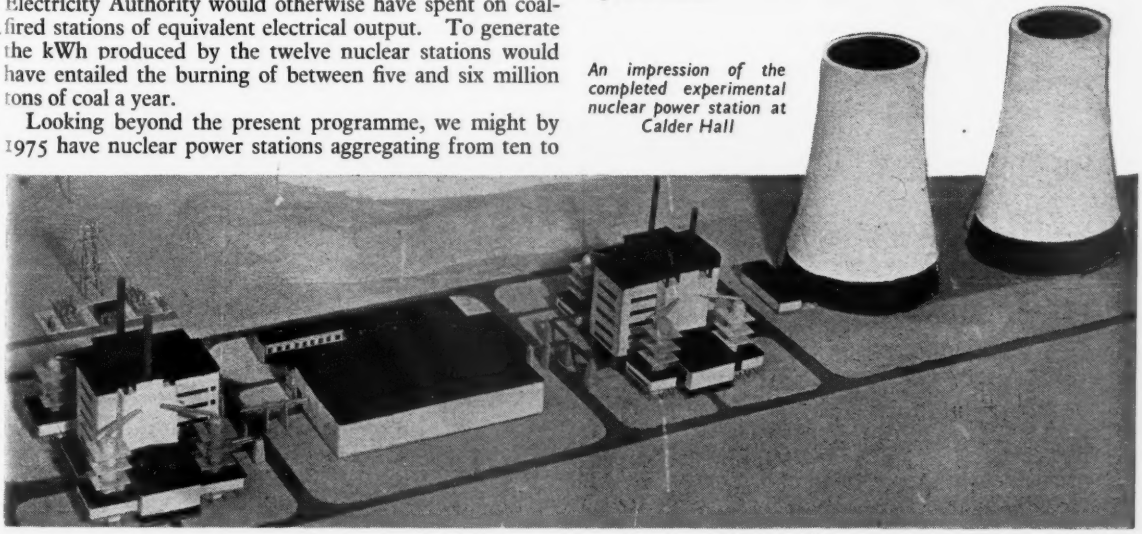


The build up of nuclear power, 1955–1975

fifteen million kW, the output of which if generated in coal-fired stations would have consumed annually 40 million tons of coal. Within twenty years the U.K. demand for electricity was estimated to reach 3½ times the present figure. Coal production had risen from 175 million tons in 1945 to 214 million tons in 1954, but the demands of industry had risen even more rapidly. Coal production could not be indefinitely expanded to meet these needs and the relief from the strain would be welcomed in the coal industry, which would for generations continue to be the backbone industry of the country; the Coal Board's own programme must be carried out with all possible speed. Increasing use would be made of oil, as exemplified by the railway plans for using diesels, but it could not sufficiently supplement coal. From 1965 onwards there was a good chance that an adequate supplement could be found in nuclear power.

A second important benefit would be the development of a new export trade, firmly based on a home market by a three-way partnership. The Atomic Energy Authority would continue its pioneering work in developing new techniques and passing on its knowledge and experience to industry, which would build the power stations, to the order of the electricity authorities, which would own and operate them.

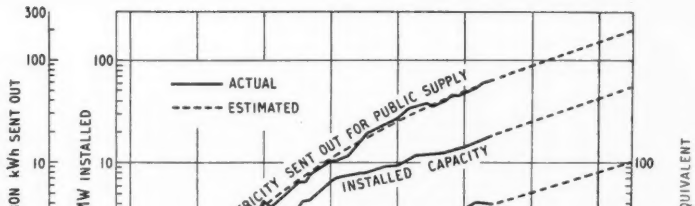
An impression of the completed experimental nuclear power station at Calder Hall



Scope would thus be found for the nation's traditional genius for mixing a small proportion of imported materials with a large proportion of skill, ingenuity and inventiveness. Thanks to its nuclear pioneers this country could lead an industrial revolution in the twetnieth century that would repeat the success achieved in the earlier industrial revolution, which transformed the world in the nineteenth century.

Electricity was the channel through which the new source of power must be brought to homes and industries and the electricity authorities accepted wholeheartedly the opportunities offered them to play for these high stakes.

The White Paper has two annexes relating to the general principles of nuclear power and to the probable demand for electricity in 1955-1975. Under the first heading particulars of the construction of the atom are followed by a description of the type of reactor to be used at Calder Hall, as shown in cross-section in the accompanying drawing.



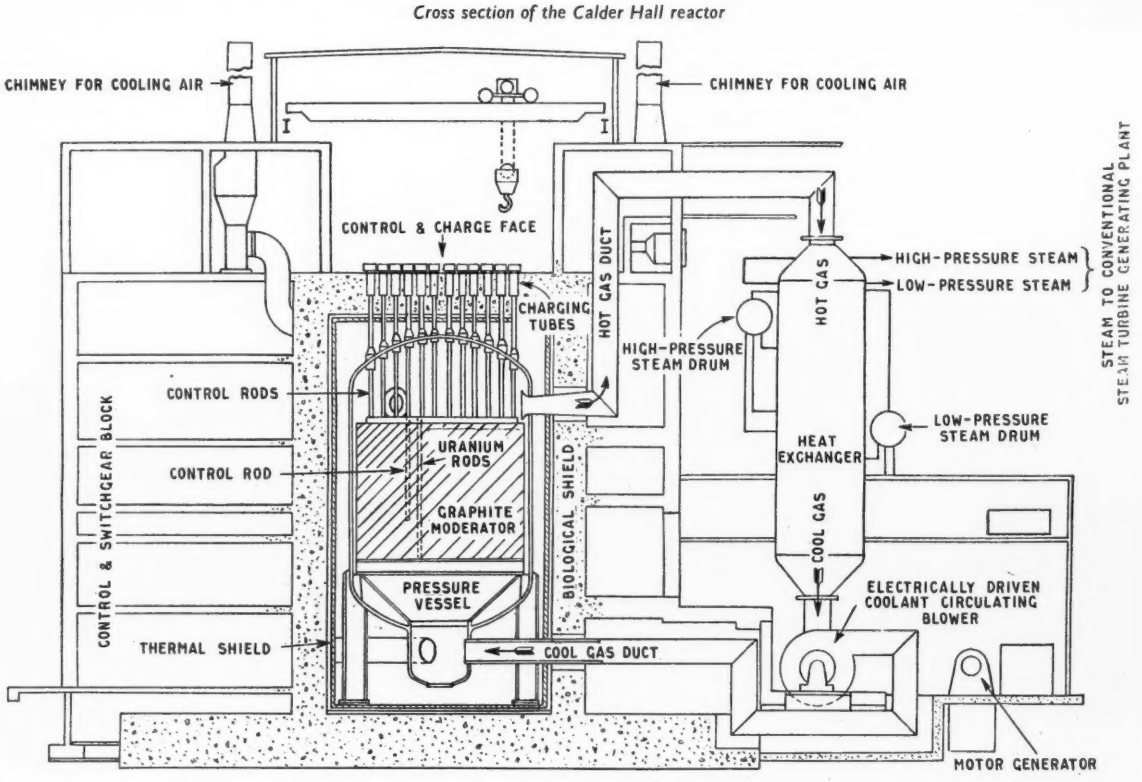
Long-term trend in electricity sent out for public supply in Great Britain

Heat liberated by the splitting of the nucleus of a fissile element (e.g. uranium 235) by a free neutron (the uncharged constituent of the nucleus) is removed from a graphite core by carbon dioxide gas and is used to produce steam, via a heat exchanger, for driving a turbo-alternator. The fuel is natural uranium 238, containing one part in 140 of fissile uranium 235. This fuel is fabricated into rods sealed in metal cans, in which fission takes place. The graphite core or moderator reduces the speed of the neutrons to the " thermal level " at which a large proportion of the neutrons are no longer captured by U238 rather than by U235, thus enabling the chain reaction to continue. The fission process is controlled by moving rods of neutron-absorbing material in or out.

Some of the U235 is gradually used up and a small fraction of U238 is converted by neutron capture into fissile plutonium 239. Eventually the fuel has to be replaced. The irradiated fuel from the reactor is chemically processed to separate the plutonium from the uranium now depleted of U235. One pound of pure fissile material if completely " burnt " would produce more heat than 1,000 tons of coal.

To burn only U235 (if it were possible) would be to use natural uranium inefficiently, but a reactor can produce further fissile material from U238 and thorium 232. The amount of new fissile material produced varies according to the fuel system and the type of reactor. Economic use of natural uranium follows its association with plutonium

Cross section of the Calder Hall reactor

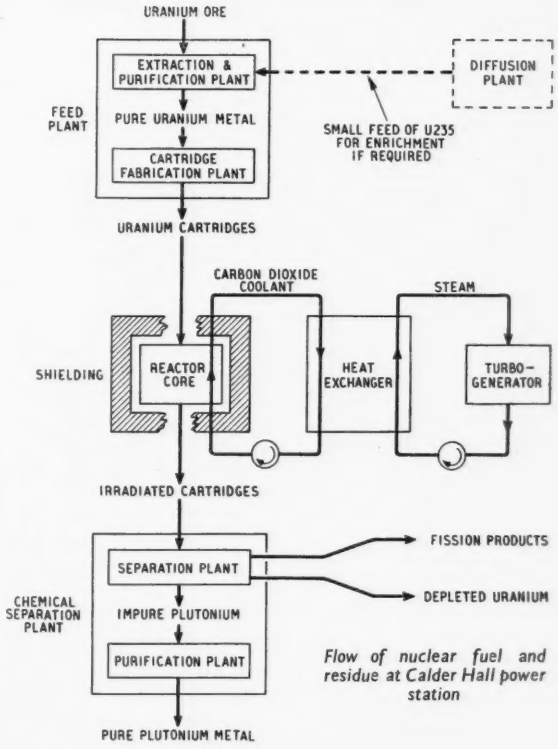


to produce further plutonium or with thorium 232 to produce fissile U233, which can be extracted and used instead of the original charge of plutonium. The plutonium could also be used with U238 in a fast reactor (containing no moderator) so that more plutonium was produced than was consumed.

Four types of atom can act as moderators in a thermal reactor: carbon, light hydrogen, heavy hydrogen and beryllium. The first (as graphite) is likely to be the most practicable in the immediate future, though light hydrogen with ordinary water is a possible alternative for producing power on a large scale. Coolants at present comprise carbon dioxide or helium, heavy water, ordinary water and molten sodium metal. The first two will most probably be used in this country during the next few years.

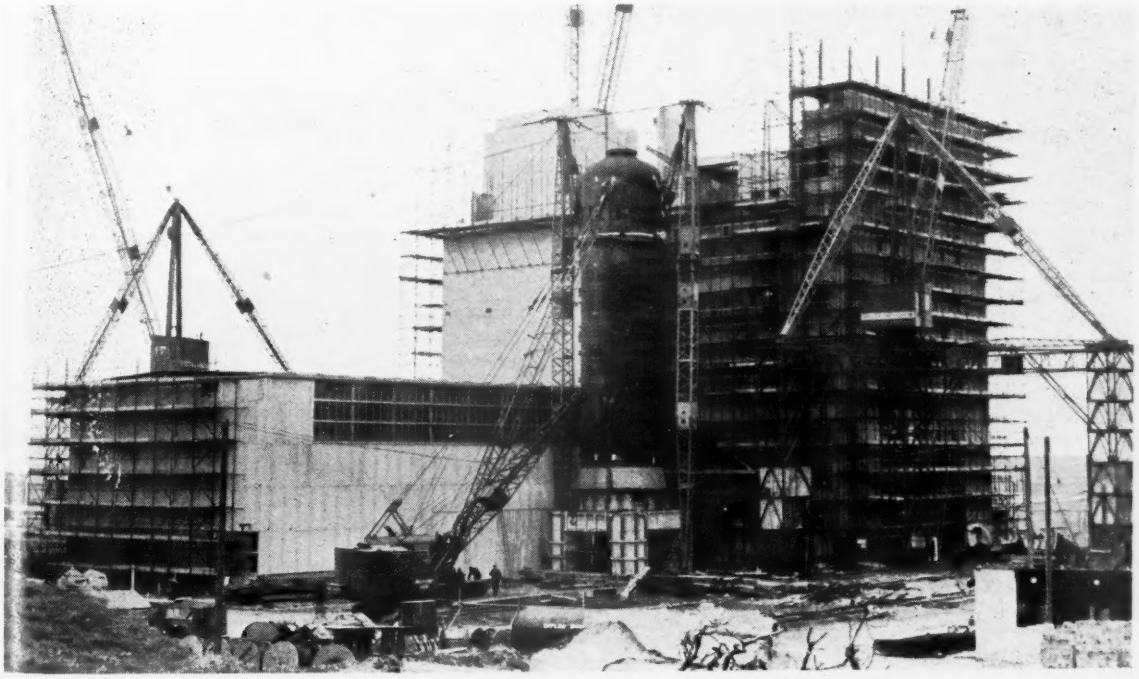
Higher heat ratings should be obtainable from advances in design of gas-cooled reactors. The use of a liquid coolant introduces complex technological problems and, unless heavy water is used, requires a higher concentration of fissile material than is present in natural uranium but which could be provided by the plutonium produced by the early reactors. Liquid-cooled thermal reactors could probably be made commercially by 1965, by which time plutonium would be obtainable from Calder Hall. By the same time a reactor using ordinary water under pressure both as coolant and moderator could probably be supplied. A less expensive " homogeneous " design of thermal reactor might be produced by mid-1960 if its fissile material were in the form not of metal rods but of a solution or suspension serving as coolant and moderator.

In order to obtain breeding of plutonium with a large positive gain factor, a fast reactor will be required, i.e. a reactor without a moderator in which the neutrons are permitted to cause fission of the fuel while they still have a considerable fraction of the energy with which they are born. The small core of a fast reactor presents many difficult technical problems, associated both with heat transfer and with the effect of high temperature on the fuel elements. The solution of these problems will take time. The design of an experimental model of a fast reactor capable of producing power is already in hand. This will be built at Dounreay and will produce data and experience for further developments. A prototype of a commercial station is not, however, likely to be tested until 1965 at the earliest; and production plants could not be expected to be in operation until the 1970s.



Flow of nuclear fuel and residue at Calder Hall power station

First of four 80ft heat exchangers hoisted into position for the first of the two reactors



AIRCRAFT ELECTRICAL SYSTEMS

Sundstrand Constant Speed Drive Advances Adoption of A.C.

ELECTRICAL systems in aircraft have been supplied up to the present from a d.c. source because of the difficulties of providing a constant speed prime mover for an alternator without a considerable increase in total weight. D.c generation gives rise to a number of unwelcome difficulties: excessive brushwear at high altitudes, greater generator weight compared with a.c., circuit breakers are bulky, the supply voltage is not easily changed for different equipments, and if one leg of the two connections fails complete shut-down results. Not only does the use of a.c. eliminate these troubles but it has the additional advantages that the alternator can be designed for optimum operation at a particular speed, that three-phase induction motors are much simpler than their d.c. counterparts and that partial functioning can still be maintained if one phase fails.

The Sundstrand drive is the method adopted by the English Electric Co., Ltd., to provide a fixed frequency supply, and they are now manufacturing it in this country under the terms of an agreement with the Sundstrand Machine Tool Corporation of America. A demonstration and test rig of two of these units has been built at the Acton works of D. Napier & Son and was shown to us recently.

Differential type hydraulic drives are found to be very competitive with other types in installed weight and in higher overall efficiency, the latter resulting in a lower fuel expenditure for electrical power, an important point on long-range aircraft. It has been found best to extract power from the propulsion engine shaft as this has negligible effect on the engine performance and control.

System of Operation

The Sundstrand drive produced by the English Electric Co. will produce 50 h.p. continuously over a speed range of 3,000 to 8,300 r.p.m. on the prime mover, and it is used to drive an alternator at a constant speed of 6,000 r.p.m. The drive unit is shown schematically here. Power from the aircraft engine is applied to the transmission by the input shaft and is transmitted through gears to the rotating cylinder block assembly.

Initial rotation of the input shaft simultaneously starts the make-up and scavenging oil pumps, 14 and 15. As the pump and motor are not self-priming, a gear type make-up oil pump is used to deliver oil to the pump and motor assembly and the governor system. This make-up oil pump supplies the inlet of the main piston pump and motor so that the pistons, 1, and push rods, 2, will be held in contact with the output controlling swash plate assembly at all times and ensures that a full charge of oil will be maintained in the high pressure hydraulic circuit.

The variable-displacement pump consists of the cylinder block assembly, 6, the pump swash plate assembly, 4, and the manifold assembly, 3. As the make-up pressure holds the pistons against the swash plate assembly, piston stroking is accomplished when the cylinder block is rotated. The displacement of the pump is regulated by the angle of the swash plate which is determined by the governor system through a hydraulic signal. The manifold assembly serves to deliver make-up oil to the pump and return oil to the pressurized case.

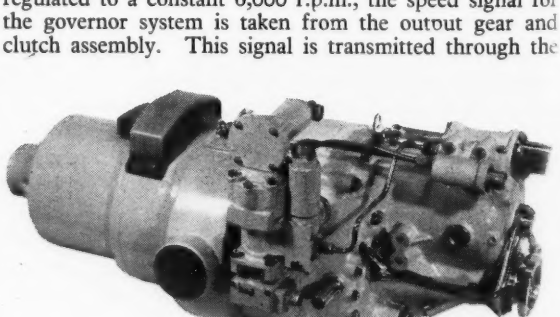
The fixed-displacement axial-piston motor consists of the motor cylinder block assembly, 10, and the swash plate drive shaft assembly, 11. The motor cylinder block assembly receives high pressure oil which forces the pistons to move out against the fixed-angle swash plate, thus converting axial-piston movement into rotary motion. The swash plate is free to rotate independently of the rotating cylinder block and hence can operate at speeds in excess of or below that of the rotating cylinder block assembly. The offset of the motor valve plate is always in the same position with respect to the angular position of the swash plate, this being such that the motor push rods exert a clockwise torque upon the swash plate.

With the pump swash plate in maximum overdrive (maximum positive angle), the output shaft overspeeds the input shaft. After gear ratio corrections, this overspeed is the ratio of maximum pump displacement to the fixed displacement of the motor minus piston leakage. The swash plate remains in this maximum stroke position until output speed reaches 6,000 r.p.m.

With further increase in input speed, the normal tendency is to increase the output speed. At this point, however, the governor regulates the control piston, 5, and swash plate assembly to decrease the pump piston stroke. Less oil then flows from the pump to the motor and therefore the differential speed between the motor shaft and the cylinder block assembly is reduced to retain constant output speed.

When the input speed exceeds output speed the cylinder block assembly will be turning faster than the motor shaft which always operates at constant speed. Relative motion between the cylinder block and motor shaft will now be in a reverse direction since it is necessary to subtract from input speed to maintain governed output speed. Owing to the cylinder block overspeeding the motor shaft, the pump swash plate is held in an underdrive position (negative angle) which permits an oil flow from motor to pump. In effect, the pump is now motoring and the power flow in the hydraulic units is reversed.

The alternator is driven through a full complement over-running, sprag type, one-way clutch in the output gear and clutch assembly, 12, of the transmission. This clutch is necessary to prevent power from being directed through the transmission opposite to that from the main aircraft engine under conditions when the alternator is tending to act as a motor. As the output speed has to be regulated to a constant 6,000 r.p.m., the speed signal for the governor system is taken from the output gear and clutch assembly. This signal is transmitted through the



Sundstrand constant speed drive unit and alternator

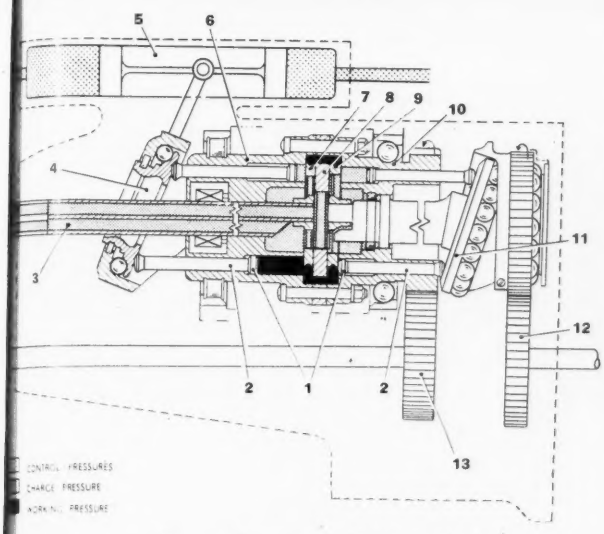


Diagram of constant speed drive mechanism

tachometer drive shaft and centrifugal switch to the governor assembly.

The governor control circuits have two functions: to keep the alternator frequency constant and to equalize real load distribution between machines operating in parallel. If, owing to a change in engine speed or alternator loading, the frequency tends to drift from the correct value, a frequency discriminator circuit develops a rectified d.c. signal proportional to the deviation and of appropriate polarity depending on whether the frequency is tending to increase or decrease. The signal is taken to a magnetic amplifier which produces an equivalent a.c. signal which is fed to one winding of the two-phase governor control motor, the other phase being supplied with a fixed phase voltage. The control signal leads or lags this voltage by 90 deg and so causes the motor to rotate and adjust the governor control spring setting to correct the frequency deviation. A close speed control is achieved, the frequency being held between $\pm$ 1 per cent over the range.

The alternator is of the separately excited type with its exciter built in as an integral part of the machine. The general design is similar to one on which several thousands of hours of operational service have been accumulated. The exciter is supported between the main bearings of the alternator, resulting in a compact complete assembly, and the characteristics of the alternator-exciter combination are such that a high short circuit current is available for fault clearing. A further advantage of the separate exciter is the fact that it is immune from the effects of heavy overload or short circuit and it is designed so that it is not demagnetized during these conditions. There is no danger of the exciter losing its residual magnetism.

Special care is exercised in the electrical design to limit harmonic content to the minimum and provide a waveform which is satisfactory for all aircraft applications. Full use is made of the active material and to enable the machine to operate at high temperature glass insulation is used and the windings impregnated with silicone varnish. Iron losses are kept to the minimum by the use of high-grade low loss core plate steel.

The alternator has a rating of 40 kVA and the overload ratings of the drive unit are 75 h.p. on a five-minute intermittent basis or 100 h.p. on a five-second intermittent basis.

The test rig shows very clearly the constancy of voltage and frequency obtained from the alternators under the various conditions of loading and speed variation likely to be encountered in practice, with either one machine only or two in parallel. Rapid change of speed in either direction, of one or both machines, does not affect the output. This type of drive is now in service in the United States and its introduction to this country may well have a profound influence on the future development of aircraft electrics.

Associated Dynamo and Motor Manufacturers

MR. F. H. SCHROEDER, as chairman, welcomed the guests at the annual dinner of the Associated Dynamo and Motor Manufacturers held on 15th February at the Trocadero Restaurant, London. He said they were especially honoured to have Sir Walter Puckey, president of the Institution of Production Engineers, as their principal guest, and Lord Sempill, a past-president of that same Institution. Among the other guests mentioned were Sir John Eldridge, K.B.E., D.S.O., Controller of Munitions at the Ministry of Supply, Sir Norman Kipping, J.P., director of the Federation of British Industries, and Sir Percy Mills, president of the Engineering and Allied Employers' National Federation.

Referring to the monopoly inquiry, Mr. Schroeder said that some forty years of development of the dynamo and motor manufacturers' association had led to the stabilization of prices which, while ensuring the maintenance of a high standard of quality, had enabled members to obtain a fair share of the total business in the face of world-wide competition. This was not a monopoly, and if the work of the B.E.A.M.A. was restricted it would influence the well-being of thousands of people and he hoped that a true understanding of the benefits brought to the industry by the B.E.A.M.A. could be well publicized in overseas countries as it was easy for them to misinterpret reports from home.

Mr. C. M. Gray, O.B.E., senior representative of the Australian Department of Development, replied on behalf of the guests and stressed that Australia, with a rapidly rising population of 9 million, only half a million of whom worked in the primary industries, had to industrialize and, because of her remoteness, had to become as self-sufficient as possible. It was certain that for many years to come major units of power production and use would be among the selective imports she could allow. They now produced about eight-ninths of all their requirements and there was no doubt that family ties would ensure the remainder of their needs coming from the United Kingdom.

Sir Walter Puckey proposed the toast of the Association and spoke of the part played by the electrical industry in the prosperity of Britain. He looked on the steam engine as the backbone of the first stage of the industrial revolution, and the electric motor of the second stage, with the emphasis on flexibility and small factory units. The thermionic valve might well represent the third stage and the advent of the automatic factory be a major preoccupation of the next decade. In commenting on the work of the Monopolies Commission he felt that members of the Association devoted most of their time, not to selling fewer motors at higher prices, but to making more of them, better, cheaper and quicker.

Mr. H. W. Bosworth (Lancashire Dynamo & Crypto, Ltd.), in replying, stressed how through their Association they had built up a spirit of goodwill and sympathy in hard times between intense competitors. That was worth a great deal.

Electrical Contractors

SPEECHES AT THE ANNUAL DINNER

UNDER the chairmanship of Mr. A. F. Plummer, Associate I.E.E., the president, about 600 members of the Electrical Contractors' Association and guests were present at the annual dinner of the Association held at Grosvenor House, London, on 15th February. The two principal speeches were those by Mr. J. Eccles, C.B.E., B.Sc., M.I.E.E., President of the Institution of Electrical Engineers, who proposed "The Allied Associations and Honorary Officials" (E.C.A., N.E.C.T.A. and N.F.E.A.) and that by Mr. Plummer, who replied to the toast.

Mr. Eccles said that the principal aims and objects of the E.C.A. were to improve members' technical and general knowledge, to promote excellence in electrical work and just and honourable practice in the conduct of business. In the achievement of these aims the Association had established a claim to the electrical industry's high regard. The high standard of qualification for membership, the apprentice training scheme and the guarantee of work scheme which insured customers against bad workmanship or faulty materials had won the esteem of the British public. This was proved by the fact that up to 90 per cent of the work in this country undertaken by private electrical installation contractors was performed by E.C.A. members.

The Electricity Boards, which supplied electricity but also did a limited amount of electrical contracting, were a matter of concern to contractors who wondered what the effect would be on their means of livelihood. Some genuinely feared that these powerful corporations would run them out of business.

To allay that fear the British Electricity Authority and the Electricity Boards took an early opportunity of reaching agreement with the E.C.A. on the principles governing the conduct of electrical contracting and trading. So far as he was aware, those principles had been honoured by both sides. Contractors should realize that the activities of the Boards in the distribution of electricity and their desire to secure new consumers and new uses for electricity, would have a far greater effect on the volume of installation work than anything the Boards did as installation contractors.

Mr. Plummer said that this was probably the first time for twenty years that an E.C.A. dinner had been held when the country was not in the middle of, just starting, or just finishing a financial crisis. For this he thought they should praise the Chancellor of the Exchequer, the Government generally, the men who controlled our industries, and the technicians and working men who translated ideas into saleable objects; but perhaps more important than any were the technologists as represented by the President of the Institution of Electrical Engineers.

Although the E.C.A. might represent the smallest section of the electrical industry, numerically and financially, he stressed its importance as being the link connecting the public, on whom all depended, with the products of the manufacturers, and enabling the public to use the power which was so efficiently supplied by the Electricity Boards. The recognition of the Association by the I.E.E. was evidenced by E.C.A. representation on Institution committees and by frequent consultation with the E.C.A. on a variety of subjects. He suggested that more interest in the Institution might well be shown by many contractors. He also testified to the co-operation which existed between the Association and organizations representing other sections of the industry.

Mr. Plummer thought that the foundation of the Fair Trading Council might be considered as a milestone in the affairs of the Association. The Council's work, supplemented by negotiations between individual associations, had progressed, but not so actively as could have been wished. It was probably because of the Council's deficiencies that the Government decisions arising from the recommendations of the Monopolies Commission had been thrust upon them.

He would like to see the Fair Trading Council undertake a full and thorough review of the existing trading structure of the industry, with a view to taking immediate steps to rationalize the distribution of electrical goods, so that the public would benefit economically and each section of the industry would obtain due recognition for the service it rendered. All would be well if each section confined itself to its proper activities.

Referring to wage disputes, Mr. Plummer said that the Government had taken on very great responsibilities in its participation in industrial negotiations which, until recently, had been regarded as a matter for the negotiating machinery of the industries concerned.

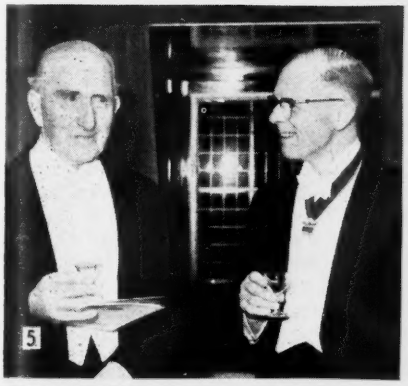
The toast of the guests was proposed by Mr. A. V. Milton, Associate I.E.E., vice-president of the Association, who made particular reference to Mr. L. W. Joynson-Hicks, Parliamentary Secretary, Ministry of Fuel and Power, Mr. Eccles, and Mr. Jefferiss Mathews, vice-president, Royal Institute of British Architects.

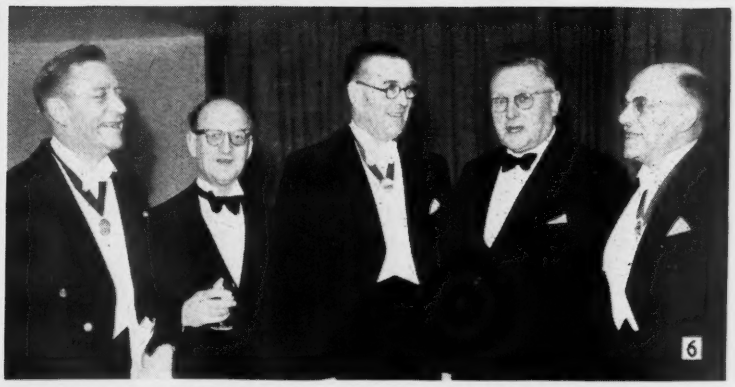
"A Right Step"

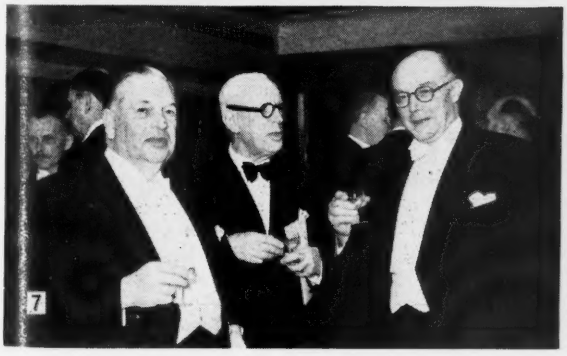
Mr. Joynson-Hicks, who made the first reply to the toast, said he felt that the contracting side of the industry had not done too badly of late; it had increased its turnover by 30 per cent against a 20 per cent increase on the nationalized side of the industry. He was glad to learn that the industry as a whole had agreed to set up a National Inspection Council which was a right step in an important direction. He described that day, upon which the new atomic energy programme had beeen announced, as the dawn of the nuclear fission age. As a nation we were right in the forefront in the generation of electricity but were we so far advanced in the use of electricity? He believed that the electrical industry was going to bring industrial development generally to the front. The demand for electricity was coupled with things like the demand for clean air and the demand for exports, which exercised a considerable influence on the industry. The outlook for the electrical industry was exceedingly rosy and it was difficult to see a limit to the demand for the commodities that it had to offer.

Mr. Jefferiss Mathews, who also replied to the toast, said it was fair to say that there had sometimes been conflict between the contractors and architects: for example, when the contractor wanted to put an enormous cable in some embarrassing position. There was no reason for such a conflict which should be avoided if only on the score of increased cost, for both architect and contractor had the joint responsibility of keeping cost down. The

1.—Mr. A. F.
(Vice-preside
4.—Messrs.
President).







Members and Guests at the Electrical Contractors' Dinner

1.—Mr. A. F. Plummer (president), the Hon. L. W. Joynson-Hicks (Parliamentary Secretary, Ministry of Fuel and Power), and Mr. J. R. Halliwell (vice-president). **2.***—Messrs. R. H. M. Drake, J. G. Briggs and J. R. Halliwell.* **3.***—Messrs. H. T. Young, S. L. M. Barlow and J. G. Briggs.* **4.***—Messrs. C. T. Melling, T. W. Heather, H. T. Young, S. L. M. Barlow and T. G. N. Haldane.* **5.***—Sir George Gater and Mr. R. A. Marryat (vice-president).* **6.***—Messrs. L. C. Penwill (director and secretary), W. E. Babb, W. T. Trace, R. L. Booth and A. V. Milton (vice-president).* **7.***—Messrs. L. Howles, V. W. Dale and E. Long.* **8.***—Messrs. J. G. Briggs, J. Eccles and W. T. Trace*

contractors wanted facilities for their work and the architects failed if they did not give them such facilities. Architects and contractors did not meet soon enough on the job. There was still a division between the design and the function of the job, but the architects were only too anxious to know the latest developments that contractors could give them. The atomic developments announced that day called for an entirely new approach. The true tradition of architecture was progress and he hoped that that tradition was to be renewed.

The health of the chairman was proposed by Mr. R. J. Griffin, and Mr. Plummer briefly replied.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Status of Professional Engineers

I AM interested in the part of Mr. A. P. Vacca's letter under the above heading (*Electrical Review*, 11th February) where he complains that the professional engineer during his relatively long leisure hours has to grease his car, dig his garden and do odd jobs around the house "for which he is ill equipped." What a remarkable outlook on life: quite apart from any financial angle, most of us thoroughly enjoy this sort of work, and surely the mental relaxation derived from a complete change of work must be beneficial. Certainly the physical exercise of gardening is of benefit to many. When Mr. Vacca receives the remuneration he undoubtedly deserves, I can picture him surrounded by motor mechanics, carpenters and gardeners, while he is just being busy being a professional engineer!

Some years ago I remember an editorial in the *Review* which deplored the over serious mindedness of electrical engineers, and attributed it to the lack of opportunity for students to take their proper place in social activities due to the intensity of their training. Certain it is that, by and large, professional engineers are very poor company outside their work, and I think that they would be better engineers if they did not take so much trouble to impress on people that they are "dedicated men" with no time or use for the good things of this world.

Luton. A. F. PLUMMER,
Shoolbred Electrical Co., Ltd.

WHILE agreeing with the views expressed in the earlier part of Mr. A. P. Vacca's letter (*Electrical Review*, 11th February), I really must take exception to the suggestion that engineers have to spend their leisure time attending to their car, repairing their furniture or improving their house property all "inefficiently." Most engineers by their training and interest are very well fitted for doing all sorts of repairs and while probably not so quick as the man constantly doing the particular work, can turn out quite as satisfactory and often a better finished repair.

The satisfaction of doing the thing yourself is one of the main reasons for not farming out such work. Many a man's greatest interest is in his garden, where creative genius can be displayed and all sense of frustration dissolved.

Owslebury, nr. Winchester. C. A. WYNNE, B.A., B.A.I.

Shortage of Technologists

AS your correspondent "Another Third Assistant Engineer" quite rightly surmises, I have commercial interests but am also an engineer; in our industry engineers without the proper commercial training are useless as leaders. Had the industry left load development to private contractors, etc., we should be thirty years behind the times, with much higher tariffs than we have to-day.

Men such as "Another Third Assistant Engineer" are an anachronism in that job. We want employees who are wholeheartedly with us—not against us.

St. Helier, Jersey.
W. K. ALLEN, M.Eng., A.M.I.E.E., A.M.I.Mech.E.,
Managing Director,
Jersey Electricity Co., Ltd.

MAY I trespass upon your space to reply as briefly as possible to the critics of my letter which you published in your issue of 14th January.

With nearly thirty years' experience in the electricity supply industry, I would not be so foolish as to belittle the value of a good showroom supervisor, or suggest that he "should be placed in penury for the benefit of the engineer." As a member of N.A.L.G.O. I welcome the recent news of salary increases to N.J.C. employees and agree with Mr. E. W. Rogers that the commercial men deserve a place in the sun.

My letter should be read in conjunction with the *Electrical Review* editorial of 17th December. If the supply industry wishes to benefit from the proposed provision of increased facilities at universities and colleges for technological training it must offer to professionally qualified and trained engineers in responsible posts the higher rewards normally associated with superior academic qualifications and long specialized training in other professions such as law, medicine, accountancy, etc. Obviously the same applies in so far as the industry requires the services of qualified lawyers, accountants and higher administrative staff, but it is significant that there is a shortage of engineers on whom the industry primarily depends and to whom it looks for leadership.

London, N.W.14. D.J.C.

I.E.E. Western Centre

The summer meeting of the Western Centre of the Institution of Electrical Engineers will be held at Carlyon Bay Hotel, St. Austell, Cornwall, from 20th to 23rd May. The preliminary arrangements include an informal dinner and dancing on the first day, a ladies' golf competition and a formal dinner and dance on the second day, and a men's golf competition and an informal dinner followed by an entertainment and distribution of prizes on the final day. Members wishing to reserve accommodation should notify Mr. A. H. McQueen, hon. assistant secretary, 15, Great George Street, Park Street, Bristol, 1, by 28th February.

INDUSTRY AND THE HOUSE

Atomic Power and Railway Modernization Plans

By A. M. F. PALMER, A.M.I.E.E., M.P.

THE really exciting news in Parliament from the industrial point of view in the last week or so has been the publication of the Government White Paper outlining plans for building twelve nuclear power stations during the next ten years. The announcement was made to the House of Commons rather unexpectedly by the Minister of Fuel and Power, Mr. Geoffrey Lloyd, not on a Monday, which is his normal day for questions, but on a Tuesday. Mr. Lloyd said that in the Government's view the successful use of atomic energy to generate electrical power on a commercial basis was of crucial importance to the future of the nation's economy.

Mr. Robens, for the Labour Opposition, thought the statement a great tribute to the principles of public enterprise. Members would study the White Paper with the closest attention, and might then require to put detailed questions. In the meantime he was anxious to know what part the British Electricity Authority would play? The Minister replied that owing to the secrecy of much of the knowledge on which the programme was based it had been necessary for the Government themselves to take the initiative, but they were now glad to give the British Electricity Authority an opportunity to enter the field as part of its normal activities. Although the Atomic Energy Authority would act as expert advisers, the B.E.A. would arrange for private contractors to build atomic power stations in the usual way. The Government looked forward to a period of " constructive co-operation " between public and private enterprise in the great work ahead.

Answering a former Minister of Supply, Mr. George Strauss, Mr. Lloyd stated that in the first ten-year period the output of the new stations would be from 1½ to 2 million kW and at the end of the second period between 10 and 15 million kW. In a reference to the reproductive properties of atomic reactors, which enabled them to " breed " their own fuel, he went on to say that the first series of power stations might well produce fuel (plutonium) for use in the second group of stations.

Since the Minister's announcement and the publication of the White Paper—which has been widely reviewed in both the technical and the general press—the writer has had the opportunity of visiting the industrial division of the Atomic Energy Authority, with other interested Members of Parliament, and seeing at first hand something of the impressive work done already and that projected for the future. To an electrical man the Calder Hall power station, now in the course of construction, is vastly interesting because it is the undoubted prototype of the power station of the future. A first impression, not easily lost subsequently, is the great physical spread of the plant for what is a relatively modest output. However, the plant's engineering, as distinct from the involved scientific research which has gone into its design and planning, seems to be relatively straightforward. It may well be that when once certain fundamental difficulties in relation to temperatures have been overcome, the routine operation of an atomic power station will bring about fewer " headaches " for the technical staff than does the present conventional type.

The medium for heat transference at Calder Hall is carbon dioxide with the piles using natural or slightly enriched uranium as fuel, a practice likely to be followed for the first few stations brought into commission. It is fair, therefore, when estimating the true cost of the electricity produced to look at the long-term financial balance, including credits represented by the value of the plutonium " by-product." This is said to give a generating cost of 0·6d per kWh, which is not far away from that attained in the best modern coal-fired stations.

If it be assumed on a not entirely hypothetical basis that nuclear power is directly competitive with power derived from coal, the coming question in the minds of Members of Parliament will be just how far is the future development of coal mining likely to be modified by nuclear expansion? What, in short, is the correct balance between capital expenditure on coal mining and capital expenditure on nuclear power? How far are these complementary, if at all? I predict this point will be investigated with rather greater penetration by M.P.s when once the glamour and novelty of the recent announcement has worn off.

In the meantime Members in all parties are full of admiration for the energy and vision shown by the comparatively young scientists and engineers at the head of what is now Britain's youngest industry. Unlike the more grandiose planning of the United States, the British atomic energy programme means the recognition of a clear national emergency in the supply of energy to meet the needs of rising productivity and full employment.

Transport Bill Debate

Earlier the House of Commons had given time to debating the railway modernization plan when the Transport (Borrowing Powers) Bill was given a second reading. In his introductory speech the Minister of Transport, Mr. Boyd-Carpenter, said it was vital to keep some flexibility between the two forms of propulsion, diesel and electricity, because it might then become more apparent which was truly economical. If nuclear generation brought about a fall in the price of electricity the Transport Commission would be wise to extend the track it proposed to electrify as operating costs would be proportionately lower. He went on to say there was room for both electrification for high density traffic and diesel propulsion for low density traffic. He did not exclude the development of the gas turbine, with which the Commission was now experimenting. It was intended in the near future to invite tenders for a " substantial number " of main line diesel locomotives. Extensive plans for electrification were proposed. In the Southern Region the third-rail system would continue to be used, but elsewhere the overhead method would become standard, as in most other countries.

Contributions to the debate were made by—among others—Viscount Hinchingbrooke and Mr. Nabarro. The former regretted that there was no mention of any reconstruction of the London railway stations. Their high vaulted roofs had been built for gigantic emission of smoke and steam; when diesel or electric locomotives were gliding in and out the same stations would seem " cold, remote, medieval

and sepulchral." Mr. Nabarro, as full of novelties as ever, thought a Midlands tube railway should be constructed, running from Coventry to Wolverhampton and Sutton Coldfield to Kidderminster (his own constituency incidentally) with the central part beneath the City of Birmingham.

Replying to the debate, Mr. Molson, the Parliamentary Secretary, argued that the time-table of the modernization scheme was likely to be set by the number of engineering experts which the Commission could find, rather than by the supply of capital. The Government recognized that it would take some time before the full benefits of rationalization came into operation. They thought the railways could pass through their period of financial losses to solvency and in the end achieve a surplus. He disagreed with Opposition critics who demanded that the railways should have a subsidy, either directly from public funds or from other forms of more profitable transport. The Transport Commission itself had never asked for, or sought, a subsidy from the Government.

The second reading of the Bill was agreed to without a division.

NEW BOOKS

Power To-day and To-morrow. By F. Sherwood Taylor, M.A., Ph.D. Pp. 192; figs. 34; plates 12; index. Frederick Muller, Ltd., Ludgate House, 110, Fleet Street, London, E.C.4.

Much information of a kind likely to interest the educated non-scientist, for whom the book is intended, has here been brought together. Sources of energy of all kinds with statistical data, the means of winning fuel, the production of derived fuels and principles of combustion are lucidly described. Developments of to-morrow are exemplified by sections on atomic energy, heat pumps and fuel cells.

The difficulty of dealing in popular form with so vast a subject as electrical energy within a few pages is unfortunately illustrated in a number of instances with results that are likely to mislead a reader without specialized knowledge of the branch of the subject under consideration. For example, the statement that steam is raised in power stations up to critical pressure and temperature would appear to indicate, incorrectly, that 700 deg F or so is the highest value in use. The suggestion that industries would tend to be established at water power sites applies to only the very few (e.g., aluminium production) in which power is a major cost item.

That it is cheaper to transport electricity than coal becomes generally true only at the highest voltages; it is expected to be one advantage of using 275 kV for the supergrid. It might appear from the text that problems of long-distance transmission are merely a matter of ohmic loss and that the use of overhead lines is due only to their lower cost as compared with underground cables.

The comparison of costs of electricity and gas for room heating on page 73, although qualified by the statement that " some of the heat of the gas is carried up the chimney," is liable to be misleading, and is inconsistent with the figures given in the table on page 169 which show that at London tariffs the cost of electricity is somewhat less. The room temperature on page 159 should be in deg F not C.

In view of the Government plans to electrify the railways, it is odd to find this major " application of energy to human needs " (to quote the book's sub-title) dismissed in a five-line paragraph which, in effect, restricts the scope of electrification to suburban travel.

It is to be hoped that in any future edition more space will be allocated to electrical matters, so as to permit of a necessary revision of the text in regard to the points criticized, among others.—C.O.B.

Kempe's Engineers' Year Book. Edited by C. E. Prockter, M.I.E.E., M.I.Mech.E., under the direction of B. W. Pendred, M.I.Mech.E., M.I.S.I., editor-in-chief of the *Engineer*. Pp. 2,786; figs. Morgan Bros. (Publishers), Ltd., 28, Essex Street, Strand, London, W.C.2. In two volumes. Price 75s.

Although last year's edition was completely revised, the 1955 edition, the 60th, contains much new matter, including additional information on electronic engineering. Other changes are mainly of detail, though many of them are of considerable importance. A good feature is the increase in the number of cross-references in the text and in the 124 pages of index. The space allocated specifically to electrical subjects runs to about 160 pages but numerous references are, of course, made to them under other headings. Long-distance power transmission at the higher voltages apparently comes outside the scope of the work, the value of which would have been enhanced to many electrical engineers by information on such matters as the problems it entails, the possibilities of d.c., system stability and the differences in the design of pressure cables.—C.O.B.

Consulting Engineers' Dinner

Including the guests, about 280 persons sat at the annual dinner of the Association of Consulting Engineers which was held at the Dorchester Hotel, London, on 21st February, with Mr. T. G. N. Haldane, chairman of the Association, presiding.

The principal guest was General Sir Brian Robertson, chairman, British Transport Commission. In proposing the toast of the Association General Robertson referred to the plan of development for British Railways, and said that the British Transport Commission had set its sights very high and it wanted a first-class job done in double-quick time. Railwaymen in the past had started from scratch and the new plan was a challenge to the operating staff. At present the engineering staff of British Railways was quite inadequate to handle the new programme and the railways looked to the consulting engineers for future help.

Mr. T. G. N. Haldane, in his response, said that Sir Brian had brought a new spirit into the Army some years ago and to-day he was introducing a new spirit into British Railways. The Association had offered its wholehearted help in the task the Commission had before it and its members had a deep appreciation of the results of large-scale railway electrification. In the White Paper published more recently, dealing with the nuclear energy programme, it was pointed out that we must look forward to the time when the nuclear power stations would help the export trade, too. Here the consultants would play their new part in the developments. At home and abroad there was still a great shortage of scientists and engineers, and he believed that considerable economy could be achieved in making fuller use of the consulting engineer.

Mr. V. A. M. Robertson proposed the health of the guests and Mr. A. R. W. Low, Minister of State, Board of Trade, replied.

E.I.B.A. Golden Jubilee

As already announced, a luncheon is to be held at the Connaught Rooms, London, on Tuesday, 19th April, to celebrate the golden jubilee of the Electrical Industries Benevolent Association. In view of the large number of people in the industry who will wish to attend, early application for tickets (one guinea each) is advisable. Applications should be addressed to the Secretary, E.I.B.A., 32, Old Burlington Street, W.1, with a list of guests; ladies will be welcome. The reception will be by the president of the Association, Sir John Dalton, and the chief guest will be Sir John Maud, K.C.B., Permanent Secretary to the Ministry of Fuel and Power.

VIEWS on the NEWS

By REFLECTOR

ONE of the points emphasized in the railway modernization plan was that the electrification of railways in this country would prove a valuable aid to electrical manufacturers in competing with foreign manufacturers of traction equipment in export markets. I feel it is a great pity that the same consideration is not given by the London Transport section of the British Transport Commission's organization to the case of the trolley-bus. In this field Britain was the pioneer country, yet almost entirely for operational reasons and not because of cost or wishes of the public London is to lose its trolley-buses and manufacturers their main home market. This, I believe, is only a temporary set-back, for the coming of atomic power will, I am sure, reinforce the claims of electricity in the whole field of public transport. On the subject of trolley-buses, the title of an article in the *Transport World* is indicative of the trend of events abroad—"France Seeks World Trolley-bus Market." Before the war there were only a hundred or so trolley-buses in France and North Africa; by 1947 the number had risen to 650 and by 1952 there were 1,106 in operation.

* * *

Most electrical people know that Karl Friedrich Gauss was the man whose name was given to the absolute electromagnetic unit of magnetic induction in the c.g.s. system. They may not be aware that he is often held to be second only to Newton as a mathematician. Gauss lived from 1777 to 1855 and upon the occasion of the centenary of his death Sir Edmund Whittaker, F.R.S., Emeritus Professor of Mathematics, Edinburgh University, gave a talk on his work in the B.B.C. Third Programme on Monday evening. Among the activities of Gauss which Sir Edmund Whittaker mentioned was his establishment of an observatory for the study of magnetic phenomena and his relation of changes in terrestrial magnetism to the sunspot cycle. Passing reference was also made to the "de-gaussing" of ships during the war to protect them from magnetic mines.

* * *

A correspondent has drawn my attention to a report of a "revolutionary new ship." This vessel, which is stated to have completed six months of intensive trials on the Thames, is designed to carry cement in bulk. According to the account in an evening paper:—

> "No one looking at her ordinary exterior would guess her secrets—the main engines which produce electricity without separate generators, or the built-in conveyor belts in her holds."

The electricity, produced by this novel means, also drives the conveyor belts by way of magnetic couplings.

* * *

Electricity supply authorities can feel justifiably proud of the success of their efforts to avoid power cuts, particularly in view of the very rapid increase in consumption. I can appreciate, however, that the congratulatory reports which have appeared in the Press are galling to those people living in parts of the country where overloading of the distribution network has led to rather frequent breakdowns. At Forres, in Scotland, the power has recently failed for one-hour and two-hour periods. This has brought forth the scathing suggestion that the North of Scotland Hydro-Electric Board's motto "Power from the Glens" is inappropriate. Instead it has been offered a crest comprising three candles over a box of matches.

* * *

After-dinner humorists have made much play of the similarity of our new power stations to cathedrals—and conversely. The severity of line employed by the architects of both kinds of building and the use of brick facing certainly give some excuse for the comparison. Cathedrals and power stations were coupled together by Sir David Eccles, Minister of Education, in quite a different and more serious way in a speech he made at Exeter last week. His theme was the complete education of scientists and engineers to make them good citizens as well as experts in their technological and technical fields. I think he was a little sanguine when he said that our schools and technical colleges would be able to produce enough scientists and engineers to meet the growing demand. Nevertheless time must be found for the humanities and there must be general endorsement of Sir David's plea:—"Let us teach our children to study man as well as mathematics and to build cathedrals as well as power stations."

* * *

In the 'eighties electric lighting was passing through a difficult phase. One of the earliest installations, at Colchester, was on the point of closing down, and a gas spokesman in another town declared that "competition from electric lighting has almost died away." Apart from the fight against the firmly entrenched gas industry, there was internal discord over the rival claims of arc and incandescent lamps. In the *Electrical Review* of 21st February, 1885, a correspondent wrote:—

> "Gas is quite good enough for street lighting if you don't want a larger amount of light than gas gives, as there is always an abundance of oxygen in the air for gas to consume between the top of the lamp post and the moon. I contend that the richest city in the world . . . ought to have the principal streets lighted like daylight . . . and the use of incandescent lamps for such a purpose would be a perfect farce and as a result would end in fiasco, for the simple reason that the use of incandescent lamps, all things considered, does not show any advantages over gas where a lighting power of 20 to 60 candle power is considered sufficient."

It was, in fact, not until the arrival of the electric-discharge and fluorescent lamps that electricity gained complete supremacy over gas for public lighting.

OVERSEAS ELECTRICAL TRADE

High Level of Exports in January

THE year has opened promisingly in regard to exports of British electrical goods, and January's total was only a little below the high figure for December, while it was considerably higher than for January, 1954. No doubt there was still some equipment held up at the docks as the result of the recent strike which had to be cleared.

The total value of exports of electrical machinery, apparatus and appliances was £17,007,591, as compared with £14,957,845 for January, 1954. The various articles covered are listed in Table I, destinations being given in Table II. Among the items not included in the figures are:—Washing machines, not exceeding 150 lb net weight, £256,793 (£298,005 in January, 1954); ditto, over 150 lb but not exceeding 250 lb, £143,023 (£98,030); ditto, parts, £59,503 (£33,187); welding electrodes (excluding carbons), ferrous, £99,883 (£71,104); ditto, non-ferrous, £24,091 (£15,713); and electric conduit tubes and cased tubes, £70,885 (£65,411). The addition of these exports makes January's total £17,661,769, which compares with £15,538,295 a year ago. New classifications include thyatrons, hot cathode mercury vapour and gas-filled rectifiers, photo-electric cells, stabilizing and cold cathode valves, magnetrons and klystrons; electric furnace plant; and thermoplastic insulated cables.

In addition to the general analysis of electrical exports by destinations, the chief markets are given for a number

TABLE I.—ELECTRICAL EXPORTS

Class	January, 1955	January, 1954
	£	£
Generating sets and generators:		
Diesel-driven, up to 10 kW	130,604	117,990
Ditto, 10 to 65 kW	105,447	116,305
Ditto, 65 to 200 kW	60,055	52,634
Ditto, over 200 kW	706,237	341,702
Spark ignition engine driven	12,579	15,662
Steam turbine driven	113,639	6,811
Other prime mover driven	10,616	97,669
Generators	377,477	200,567
Parts of generators	757,002	605,586
Motors, complete, other than railway, tramway and trolley-bus:		
Up to ¼ h.p.	243,915	169,885
Over ¼ h.p. but under 1 h.p.	77,643	42,774
1 h.p. to 250 h.p.	492,754	419,051
Over 250 h.p.	212,289	101,347
Railway, tramway and trolley-bus motors complete and parts of all motors	153,040	182,318
Motor starting and controlling gear	209,953	218,509
	3,663,450	2,688,810
Converting machinery	46,796	22,596
Mercury-arc rectifiers	51,799	83,405
Transformers for lighting, heating and power (incl. coils)	1,001,663	1,082,952
Switchgear and switchboards (not telegraph or telephone)	1,480,368	1,249,119
	2,580,626	2,438,072
Primary batteries:		
Lighting	67,014	82,304
Radio	122,332	128,527
Other	51,948	46,320
Parts (excl. carbons)	41,663	60,773
Lamps:		
Filament, exceeding 24 V.	77,470	68,391
Ditto, under 24 V.	29,644	41,620
Discharge lamps, fluorescent tubes, etc.	83,607	60,891
Other lamps	16,245	93,111
Radio and television, etc., apparatus:		
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excluding mercury arc rectifiers), photo-electric cells, stabilizing and cold cathode valves, magnetrons, klystrons	39,564	—
Cathode-ray tubes	8,961	7,889
Other valves (not X-ray)	181,175	141,164
Radio and television transmitters	102,518	26,911
Commercial radio and radar equipment	837,510	907,652
Domestic radio receivers, mains	189,467	164,106
Ditto, battery	71,041	54,499
Ditto, other (incl. car)	13,695	12,363
Radiograms	43,939	24,490
Television sets	9,453	5,340
Public address equipment	84,456	63,927
Sound reproducing app., n.e.s.	23,224	15,150
Components and parts, n.e.s., incl. parts of valves and c.r. tubes	576,720	548,221
	2,181,723	1,971,712
Telegraph and telephone installations	1,005,407	504,041
Telephone instruments, separately consigned	61,504	126,228
Telegraph and telephone parts	423,218	609,844
Line apparatus for long-distance communication	113,991	205,382
	1,604,120	1,445,495

Class	January, 1955	January, 1954
	£	£
Cookers	162,907	50,564
Toasters	17,942	6,092
Other cooking apparatus	31,575	21,220
Parts and accessories	64,330	27,034
Space heating appliances	35,921	17,089
Water heating appliances	30,321	32,738
Other heating appliances	24,189	34,652
Parts and accessories	60,810	47,543
Irons	121,734	50,831
Arc welding equipment, a.c.	42,042	44,311
Ditto, d.c.	22,318	28,303
Resistance welding equipment	27,061	7,815
Electric furnace plant	22,598	—
Magnetos, ignition	14,603	9,750
Sparking plugs	142,224	168,476
Elec. appliances for aeroplanes, n.e.s.	170,334	169,731
Ditto, for motor vehicles, n.e.s.	295,658	206,642
Ditto, for cycles, n.e.s.	65,078	89,919
Signalling app. (incl. traffic signals)	44,634	54,093
Industrial radio-frequency equipment	17,481	25,543
Bell app. (not telegraphic or telephonic)	6,417	4,928
Instruments, commercial	156,367	167,336
House service meters (not prepayment)	113,924	108,417
Ditto, prepayment and parts of all house service meters	30,018	11,351
Electro-medical apparatus (not X-ray)	50,432	45,096
X-ray apparatus (excl. tubes and valves)	73,200	49,062
Vacuum tubes	27,047	26,254
Desk fans	21,312	28,338
Ceiling fans	100,078	106,817
Parts of fans	3,372	—
Vacuum cleaners	121,243	189,958
Floor polishers	109,222	85,321
Food mixers	34,308	30,399
Hair clippers and dry shavers	70,940	25,622
Other portable appliances	58,691	20,710
Parts	74,580	62,623
Portable elec. tools (not saws) and parts	180,409	125,557
Cables and wires:		
Telegraph and telephone, submarine	93,505	97,175
Ditto, other	456,534	490,377
Cotton, silk or art. silk insulated	46,836	34,382
Enamel, glass or asbestos insulated	90,558	73,110
Paper insulated	707,298	791,697
Rubber insulated	509,541	366,642
Thermoplastic insulated	64,705	—
Other	217,380	228,438
	2,186,357	2,081,821
Accumulators for motor vehicles	141,387	141,043
Ditto, traction	16,366	22,820
Ditto, radio and other portable	84,273	34,393
Ditto, other	12,997	84,872
Parts and accessories	122,820	58,739
Elec. porcelain, etc. (incl. insulators)	94,300	102,042
Insulating cloth and tape	72,672	43,515
Other insulating material	71,346	78,674
Permanent magnets	55,100	26,631
Radio, telegraph and telephone testing equipment, n.e.s.	22,551	28,227
Scientific electrical instruments (not telegraphic or telephonic)	238,119	213,548
Electrical machinery, n.e.s.	85,692	122,288
Electrical apparatus and appliances, n.e.s.	638,449	613,071
TOTAL	17,007,591	14,957,845

TABLE II.—DISTRIBUTION OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Destination	January, 1955	January, 1954	Destination	January, 1955	January, 1954	Destination	January, 1955	January, 1954
	£	£		£	£		£	£
Channel Islands	64,774	59,976	Barbados	24,318	8,464	Portuguese East Africa	15,863	27,238
Gibraltar	8,110	9,122	Trinidad	104,123	109,677	Syria	20,610	12,051
Malta and Gozo	104,773	66,456	British Guiana	34,865	26,925	Lebanon	28,683	27,123
Cyprus	104,716	77,644	Anglo-Egyptian Sudan	180,579	120,345	Israel	11,444	35,385
Sierra Leone	19,694	10,573	Other C'wealth countries	158,494	126,466	Jordan	21,097	10,064
Gold Coast	114,136	79,073	Irish Republic	299,539	283,324	Egypt	83,753	85,844
Nigeria	230,666	127,901	Soviet Union	223,241	370,521	Libya	18,954	4,547
Union of South Africa	1,731,766	1,496,307	Finland	116,042	155,268	Saudi Arabia	97,112	48,475
Rhodesia and Nyasaland	406,495	220,774	Sweden	406,898	271,524	Iraq	202,784	323,636
Tanganyika	68,116	39,700	Norway	301,994	223,130	Iran	43,999	27,141
Kenya	147,542	293,587	Iceland	17,513	9,828	Burma	169,620	153,298
Uganda	60,462	91,747	Denmark	162,659	206,078	Thailand	408,092	23,822
Mauritius	20,058	23,804	Poland	35,829	191,042	Indonesia	14,298	46,552
Aden	50,230	119,548	Western Germany	112,066	99,448	Japan	38,506	68,941
Bahrain, Qatar and Trucial Oman	62,647	92,161	Netherlands	531,203	469,838	United States of America	180,180	263,766
Kuwait	63,566	218,859	Belgium	270,899	353,454	Cuba	36,486	20,399
India	1,283,766	1,688,116	France	209,430	250,177	Mexico	25,347	27,946
Pakistan	328,589	722,671	Switzerland	68,703	82,193	Colombia	109,415	62,715
Singapore	450,550	199,740	Portugal	302,603	221,627	Venezuela	325,422	165,515
Federation of Malaya	248,382	183,938	Spain	171,265	238,316	Peru	59,204	37,838
Ceylon	139,136	127,410	Italy	183,657	235,785	Chile	148,299	19,945
British North Borneo	34,201	27,927	Austria	49,331	101,376	Brazil	92,131	65,681
Hong Kong	181,930	152,365	Yugoslavia	108,692	70,776	Uruguay	43,270	67,592
Australia	1,675,957	1,251,382	Greece	109,463	53,097	Argentine Republic	172,707	151,804
New Zealand	1,770,055	732,304	Roumania	235	27	Other foreign countries	275,160	133,759
Canada	527,609	414,143	Turkey	116,645	64,006			
Jamaica	86,006	95,087	Belgian Congo	55,186	25,056	TOTAL	17,007,591	14,957,845
			French Morocco	20,791	22,542			

of the main individual classifications. The best markets for generating sets, generators and motors were New Zealand (£530,820), Australia (£369,510), South Africa (£336,553) and Thailand (£301,279), while those for converting machinery, mercury arc rectifiers, transformers and switchgear were South Africa (£539,814), India (£379,776), New Zealand (£260,148), and Australia (£248,551). The principal buyers of valves were outside the Commonwealth countries and included the Netherlands (£194,182), Sweden (£145,795), and Belgium (£140,129). South Africa (£284,716) was the leading purchaser of telegraph and telephone equipment, the next largest customer being Portugal (£214,462). Of the £2,186,357 worth of cables, wires, etc., exported New Zealand took £376,013, India £194,101 and South Africa £139,732.

Imports of electrical machinery, apparatus and appliances totalled £1,491,696 in January (£1,138,495 in January, 1954), the chief suppliers being the Netherlands (£416,326), the United States (£314,416), and Western Germany (£215,007). Items included were valves, £161,626, and radio communication and navigational aid equipment, £161,561.

ELECTRICITY IN OIL PRODUCTION

IN a paper presented before the Utilization Section of the Institution of Electrical Engineers on 17th February, Mr. G. Gascoigne discussed the application of electricity to oil production. After surveying the various types of oil formation and the problems associated with the lifting of crude oil fluids from the natural formations to ground level, the author dealt with individual beam pumping, which is adopted at 90 per cent of pumped wells. The substitution of three-phase squirrel-cage motors for small internal combustion engines had greatly reduced loss of output, particularly that due to rod breakages resulting from resonant vibrations originating in reciprocating motion.

Power stations, usually of from 1,000 to 6,000 kW, in remote areas used natural gas as fuel. For the motors a minimum ratio of starting to full-load torque of 2·5 was necessary. Motors with high slip (about 10 per cent) were used, if the supply came from a small power station, to cope with the two peaks in the pumping cycle. They were generally of the totally enclosed or drip-proof type but need not be flame- or explosion-proof as they were not in operation when a well was uncapped for servicing. Intermittently operated pumps for "stripper" wells, if electrified, could be time-controlled automatically in groups. Average kWh per barrel of oil worked out at about 1·65 for independent drives and 0·988 for central pumping of wells in groups. For motor protection thermal over-current trips with under-voltage release were invariably employed. In tropical climates the former were usually under oil with the starting contactor as a safeguard against faulty operation due to high ambient temperatures. In temperate zones air-insulated weather-proof direct-on-line starters were used, usually mounted on short vertical lengths of 6 or 4in pipe. The power factor of a group of wells fluctuated between 0·35 and 0·55, which was improved to 0·7 and 0·85 and later to 0·9 by a three-phase capacitor connected across the motor terminals. One oil field suffered loss of production by lightning-surge voltage drops until the installation of auto-reclose relays at every well, definite time delays enabling the load to be built up gradually; this arrangement enabled full production to be attained in 15 min, whereas formerly pumping teams had to be called out (usually by night in torrential rain) and covered an aggregate distance of 250 miles in restarting more than 400 pumps.

In the subsequent discussion Mr. J. A. Newton said that the average yield per day of wells in America was 13 barrels —at 1,000 barrels a day they thought they almost had a "gusher"—whereas in the Middle East, the scene of most British experience, the normal well produced between 5,000 and 10,000 barrels a day. The drilling programme for the year in the United States was about 50,000 wells. In the whole of the Middle East it was about 150. Consequently, the Americans had greater opportunities for the development of techniques in oil production and in the use of electricity. The future, both for pumping and generation of electricity, probably lay with the gas turbine, because in many fields natural gas was available in large quantities. He believed it would replace electric motors for directly driven pumps. Electrification in oil production was small compared with that in refineries and main line pumping. The latter introduced more complicated and more scientific, as well as more numerous, applications of electricity.

Mr. Gascoigne, in reply, suggested that the bottom hole pump would not be economical for 13 barrels a day—and there were thousands of wells with such an output. The trouble with the use of surplus gas lay in controlling the gas turbine for small wells, but automatic starting had saved much time and money. He knew of one oilfield power station where a shut-down lost $75,000 an hour. The Americans were rapidly developing electric drilling rigs and these would be used extensively in the future.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Londonderry Corporation Finance Committee has adopted the report of the Staff Establishment Sub-Committee recommending the appointment of **Mr. S. A. Spence** as city electrical engineer, at a salary of £1,400 per annum. Mr. Spence has been acting as city electrical engineer since the death of Mr. R. V. Macrory.

The Council of the Institute of Fuel has elected **Mr. R. H. Gummer** as president, to take office in October next. He succeeds **Dr. W. Idris Jones,** C.B.E., Director-General of Research to the National Coal Board.

Mr. R. H. Gummer

Mr. Gummer, who is a director of International Combustion, Ltd., was educated privately and received his basic training in mechanical and marine engineering as an indentured pupil with the London shipbuilding firm of Humphrys Tennant. After a period of service in the mercantile marine, and training at Manchester in electrical engineering, he returned to London in 1912 as an assistant engineer on the electrical distribution system of the L.C.C. Tramways. He later became technical assistant to Mr. J. Shepherd, the electrical engineer of that undertaking, his period of service coinciding with a major reconstruction of the Greenwich power station. When Mr. Shepherd moved to Leeds to resume his partnership in the consulting engineering practice of Shepherd & Watney, Mr. Gummer joined him as junior partner. At the end of the 1914-18 war Mr. Gummer went to Manchester to take charge of all engineering services at the Trafford Park steelworks of Taylor Brothers & Co. Among other developments which he introduced were experimental high-duty water-tube boilers operated with the earliest designs of pulverized-fuel firing. During 1923 he assisted Mr. G. R. T. Taylor in his plans for the formation of International Combustion, Ltd. Mr. Gummer is a founder member of the Institute of Fuel, and was elected a Fellow in 1932.

The following appointments are announced by the South Wales Electricity Board:—

Mr. H. Jackson, B.Sc., M.I.Mech.E., M.I.E.E., at present in charge of the industrial supply section in the Commercial Department of the Central Sub-Area, Cardiff, has been appointed head of the industrial supply section in the Commercial Department at head office. He succeeds **Mr. W. P. Warren,** B.Sc., A.M.I.E.E., who is leaving to take up another appointment.

Mr. C. Evans, A.M.I.E.E., engineer in charge of the meters section at Fforestfach, Swansea, has been appointed head of the meters section in the Engineering Department at head office. **Mr. E. F. Bennett,** an assistant engineer in the meters section in West Central Sub-Area, has been appointed to succeed Mr. Evans.

Mr. W. J. Witts, engineer in charge of the meters section at Cardiff, has recently retired after serving for forty-seven years with the Board and its predecessors. **Mr. G. L. Thomas,** assistant engineer in the meters section at Cardiff, has been appointed to succeed him.

Dr. H. G. Taylor, director of research of the British Welding Research Association since 1947, has been elected president of the Society of Engineers. He has been associated with the Society since 1947 and has been a member of its Council for seven years.

The Council of the **Lightmongers** for 1955 is as follows:—President, Mr. W. Veness (Metropolitan-Vickers Electrical Co., Ltd.); vice-president, Mr. T. S. Jones (Crompton Parkinson, Ltd.); past president, Mr. Max Millar (The Benjamin Electric, Ltd.); hon. treasurer, Mr. R. V. Stephens (Cryselco, Ltd.); hon. secretary, Mr. V. G. E. Gardner (The Benjamin Electric, Ltd.); Mr. H. Hall (Metropolitan-Vickers Electrical Co., Ltd.); Mr. S. Anderson (General Electric Co., Ltd.); and Mr. J. E. Lane (Siemens Electric Lamps & Supplies, Ltd.).

Mr. J. H. Maxwell has been elected to the board of directors of W. T. Glover & Co., Ltd., with the executive appointment of deputy general manager. Mr. Maxwell joined the company in 1910 and with the exception of a period in the R.N.V.R. during the 1914-18 war, has served the company in positions of increasing responsibility on the commercial/administration side of its organization. Before his present appointment Mr. Maxwell held the position of general sales manager.

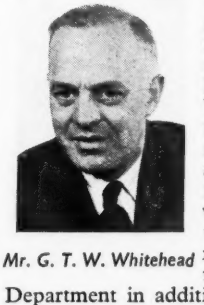
Mr. J. H. Maxwell

Mr. W. R. Gibb

Mr. W. R. Gibb, C.A., has also been elected to the board of W. T. Glover & Co., with the executive appointment of manager (financial). Mr. Gibb joined the company in the capacity of secretary in 1944, which position he held until his recent appointment.

Mr. S. F. H. Parsons, formerly director and chief engineer of C.A.V., Ltd., is now acting as a special duty director in a consultative capacity. **Mr. K. Brook,** A.M.I.Mech.E., formerly chief experimental engineer, has been appointed to the board as an executive director.

Mr. G. T. W. Whitehead, O.B.E., M.I.Mech.E., assistant general manager (works) since 1946, has been appointed general manager (works) to Johnson & Phillips, Ltd. Mr. Whitehead joined the company as an engineering apprentice in 1915 and in 1933 was appointed works engineer responsible for the Maintenance Department in addition to the design and manufacture of cable ships' equipment. As production manager during the last war he was responsible for the design and manufacture of equipment for laying pipelines under the English Channel for carrying petrol to Allied Armies in Normandy —the famous "Operation Pluto"—and it was in recognition of his part in that operation that he was made an O.B.E. Mr. Whitehead is a director of British National Electrics, Ltd., and Chapelhall Cables, Ltd.



Mr. G. T. W. Whitehead

Mr. D. P. Farrant, D.F.H., A.M.I.E.E., A.M.I.Mech.E., station superintendent, Portishead "A" power station, has been appointed superintendent in charge of both Portishead "A" and the new Portishead "B" stations of the South Western Division, B.E.A., with effect from 1st April next. Mr. Farrant, who was educated at Bromsgrove and Berkhamstead Schools, served in the 1914-18 war in the R.F.C. On demobilization in 1919 he took a four

year course at Faraday House, obtaining a first class diploma in electrical engineering. Following a short period with Crompton & Co., Mr. Farrant joined the Bristol Corporation Electricity Department in 1926 as junior charge engineer at Avonmouth. Subsequently, following transfer to Portishead, he was successively appointed chief chemist and technical assistant, efficiency engineer, and operating engineer. He was appointed to his present post in 1948.

Mr. J. R. Cox, M.I.E.E., chief engineer and manager of the Liverpool Electric Cable Co., Ltd., has been appointed to the board of the company.

Mr. J. R. Cox

Mr. C. J. Carter has been promoted to deputy chief scientific officer, Ministry of Supply, and has been appointed Director of Instrument Research and Development.

Mr. B. H. Lyon has joined the board of John Riley & Son (Electrical), Ltd., Sheffield, electrical wholesalers. Mr. Lyon is a director of Broadcast Relay Service, Ltd.

Mr. Cyril Harvey, F.C.I.S., has been elected chairman of the Board of Management of the Royal Commercial Travellers' Schools in succession to the late Mr. J. Freeman Dunn.

Mr. W. P. Warren, B.Sc., A.M.I.E.E., at present assistant chief commercial officer with the South Wales Electricity Board, in charge of industrial supplies and development, will be leaving the Board at the end of this month. He is joining the Metal Industries group of companies as general manager of Cantie Switches, Ltd., at Bromborough, Ches.

Mr. W. P. Warren

Before his present appointment Mr. Warren was senior assistant engineer respectively at Area Headquarters and the Central, West Central and Western Sub-Areas of the South Wales Board.

The Institution of Mechanical Engineers has awarded the James Clayton Prize for 1954 to **Sir Christopher Hinton** for his pioneer work in applying the results of nuclear research to the production of fissile material and industrial power.

A dinner was held by the **Revo Electric Co., Ltd.,** at Dudley Town Hall on 18th February at which long-service awards consisting of gold watches were presented to 251 employees who have completed twenty-five years' service or more with the company. Mr. W. L. Barrows (chairman) presided over a gathering of more than 500. Mr. F. Dudley Felton (managing director), in a brief address, introduced Mr. Barrows, who reviewed the history of the company since its inception some time before 1907. Others who attended the function were Mr. G. H. Gunson (deputy chairman), Mr. M. S. Vaughan (director), Mr. H. H. Wainwright (director), Mr. F. W. Norris (sales director) and Mr. G. R. King (director and secretary).

Mr. W. L. Barrows (chairman) presenting long-service awards to employees of the Revo Electric Co., Ltd.

Mr. H. H. C. Wood, who has for many years been in charge of the Purchasing Organization of the Igranic Electric Co., Ltd., has in consequence of a recent serious illness and by mutual arrangement relinquished the responsibilities of the department. **Mr. N. D. Miles** has been appointed chief purchasing officer to the company as from 1st March.

Mr. Miles Beevor, managing director of the Brush Group, Ltd., left by air on 18th February for Johannesburg for a four weeks' tour of the Union of South Africa and Northern and Southern Rhodesia. He will be visiting the Group's subsidiary company, Brush Aboe (Southern Africa), Ltd., Johannesburg.

The following appointments in the sales-service organization are announced by Hoover, Ltd.:—

Mr. H. R. Don, district manager, Edinburgh, to be dealer liaison manager in Scotland; **Mr. W. S. Jack,** district manager, Cardiff, to be district manager, Edinburgh; **Mr. D. Harper,** district manager, Darlington, to be district manager, Cardiff; and **Mr. I. A. Reid,** supervisor, Walsall, to be district manager, Darlington.

Mr. R. Ll. Rees, M.A., chemical engineer with the British Electricity Authority, and **Mr. E. A. Howes,** B.Sc., chief chemist of the London Generation Division, are attending the first International Congress on Air Pollution, to be held in New York on 1st and 2nd March. Mr. Rees is to present a paper to the Congress on the removal of sulphur dioxide from power plant stack gases. After the Congress Mr. Rees and Mr. Howes are to remain in the United States for a week or two to discuss with representatives of electrical utilities and other bodies such subjects as flue gas washing and other problems of common interest.

The annual dinner and dance of the North Midland Centre of the **Institution of Electrical Engineers** will be held on 18th March at the Cairn Hydro Hotel, Harrogate. Tickets (25s each for members and 20s each for students) can be obtained from Mr. H. G. Harlow, 46, Wellington Street, Leeds, 1.

The Engineering and Allied Employers' South Wales Association make five awards annually to the best

Sir Edward Bullard (left), director, National Physical Laboratory, and the Earl of Halsbury, managing director, National Research Development Corporation, being shown the computer "Deuce," which is described elsewhere in this issue, by Mr. J. K. Brown, director, Nelson Research Laboratories, English Electric Co., Ltd., Stafford

engineering apprentice in each age group. Three apprentices employed by the **South Wales Switchgear, Ltd.,** were successful in obtaining these awards. The prizes were presented by the Deputy Lord Mayor of Cardiff at a luncheon at the Royal Hotel, Cardiff, on 31st January.

This year's London Area golf meeting in the **Electrical Industries National Golf Championship** will be held at the Berkshire Golf Club, Ascot, on 14th July. A cordial invitation is extended to all golfers of the electrical industry in London and anyone who would like to take part should get in touch with Mr. L. H. Welch, secretary of the London Area Golf Committee, London Electricity Board, 60, St. Martin's Lane, W.C.2.

On 10th, 11th and 12th February the Juno Players, the amateur dramatic section of **Johnson & Phillips, Ltd.,** presented "Heaven and Charing Cross," by Aubrey Danvers-Walker, at Charlton.

OBITUARY

Mr. David A. Bremner, O.B.E., M.I.Mech.E., M.I.E.E., whose death occurred on 7th February at the age of eighty-eight, was director of the British Engineers' Association from 1919 to 1943. During his tenure of office as director, Mr. Bremner became closely connected with many industrial organizations. He was a member of the Grand Council of the Federation of British Industries and served on no fewer than thirty-four F.B.I. Committees. He was a member of the British National Committee of the International Chamber of Commerce and of the British National Committee of the World Power Conference. In 1928 he was elected to the Standardization and Simplification Committee of the Board of Trade and the following year to the Mechanical Industry Committee of the British Engineering Standards Association; he continued his work in the field of standardization when the latter body became the British Standards Institution. As a member of the Executive Council of the 1924 British Empire Exhibition he played an important role in the preparation of the shipbuilding, mechanical and general engineering section, of which section of the Exhibition the British Engineers' Association undertook the organization. In 1925 he was elected vice-chairman of the Committee of Experts of the Shipping, Engineering and Machinery Exhibition, which later became the Engineering, Marine and Welding Exhibition. Before he was appointed director of the British Engineers' Association he had been chief electrical engineer for the Port Said & Suez Coal Co., electrical engineer to the Borough Council of Kimberley, South Africa, and had held a number of other posts. Mr. Bremner was made an O.B.E. for services rendered during the 1914-18 war as head of the aluminium section of the Ministry of Munitions.

The late Mr. D. A. Bremner

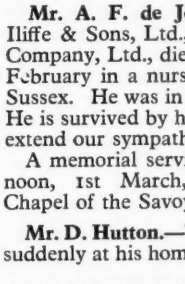
Mr. R. Eccles, branch manager in Glasgow for British Insulated Callender's Cables, Ltd., has died at the age of fifty-seven. Mr. Eccles was educated at Queen's Park School and the Royal Technical College, Glasgow. He served his apprenticeship with P. & W. MacLellan, Ltd., of Glasgow, to whom he returned after his service in the Royal Flying Corps during the 1914-18 war. He joined the former British Insulated Cables, Ltd., in 1928 and served in the Contracts Department until 1942 when he was transferred to the Sales Department at the Edinburgh branch. On the formation of British Insulated Callender's Cables, Ltd., in 1945 he was appointed transmission engineer for Scotland and held this position until 1953 when he became branch manager at Glasgow.

The late Mr. R. Eccles

Mr. A. F. de Jonquet, director of Iliffe & Sons, Ltd., and Louis Cassier Company, Ltd., died suddenly on 17th February in a nursing home at Hove, Sussex. He was in his fifty-ninth year. He is survived by his wife to whom we extend our sympathy.

A memorial service is to be held at noon, 1st March, at the Queen's Chapel of the Savoy, London, W.C.2.

Mr. D. Hutton.—The death occurred suddenly at his home on 19th February of Mr. David Hutton, managing director of British National Electrics, Ltd., the domestic appliance subsidiary of Johnson & Phillips, Ltd. Mr. Hutton was forty-nine years old. He joined British National Electrics as secretary over twenty years ago and was made general manager in 1948 and managing director in 1953. The cremation took place at Hamilton Crematorium on Tuesday last.



The late Mr. D. Hutton

Mr. E. D. Spencer.—Mr. Edward Dugdale Spencer, A.M.I.E.E., who died at his home at Newcastle-under-Lyme on 18th February, was chief engineer to Taylor, Tunnicliff & Co., Ltd., from 1924 until his retirement last year. Mr. Spencer studied engineering at the University of Manchester and gained his practical experience with Mather & Platt, Ltd. He then joined the staff of Mr. W. Pollard Digby, consulting engineer, and while on inspection work in Germany in 1914 did not manage to get away in time and was interned there for the duration of the 1914-18 war. On his return to this country he took up a post in the plant engineering section of the Metropolitan-Vickers Electrical Co., Ltd., and two years later joined Globe Tank, Ltd., Wolverhampton. He went to Taylor Tunnicliff in 1924.

Tinplate Workers' Scholarships

The Worshipful Company of Tinplate Workers, *alias* Wire Workers of the City of London, announces that the first place in the essay competition among those awarded Travelling Scholarships for 1954 is taken by Alan Islip, who is employed by International Combustion, Ltd., and was presented by the Water Tube Boiler Makers' Association and sent to the Metropolitan-Vickers Electrical Co., Ltd., Manchester, for his tour.

The second place is taken by Kenneth Rees Lloyd, who is employed by the Steel Co. of Wales, presented by the Welsh Plate and Sheet Manufacturers' Association and made his tour with British Insulated Callender's Cables, Ltd. The third place goes to Peter Bryan Heath, who is employed by British Celanese, Ltd., presented by the Electrical Trades Union, who made his tour with W. T. Henley's Telegraph Works Co., Ltd.

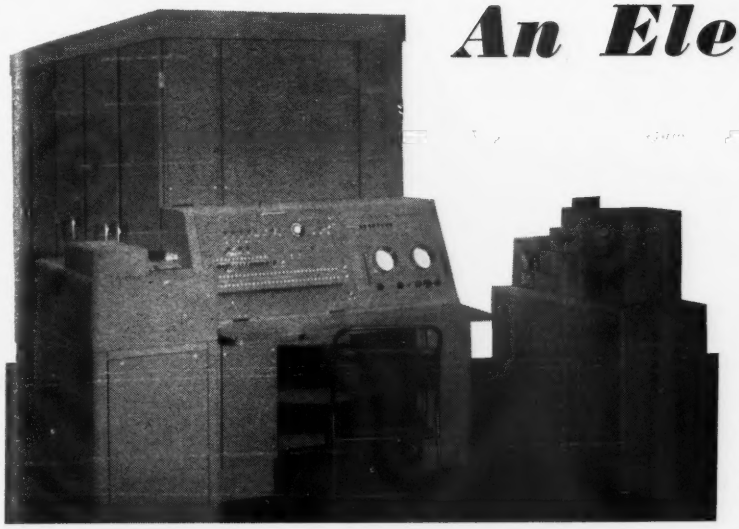
The Court of the Company expresses its thanks to Mr. H. S. Pocock and Mr. P. L. Garrett for again acting as assessors.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £163 0s 0d
COPPER, H.C. Electro	ton £336 10s 0d
Fire Refined 99·70%	ton £335 0s 0d
Fire Refined 99·50%	ton £334 0s 0d
COPPER Tubes ..	lb 3s 2½d
Sheet	ton £400 15s 0d
H.C. wire and strip ..	ton £377 0s 0d
LEAD, English ..	ton £102 15s 0d
Foreign	ton £101 0s 0d
MERCURY	flask £109 0s 0d
TIN, block (English) ..	ton £708 10s 0d
ZINC, G.O.B. Foreign	ton £88 5s 0d
Electrolytic	ton £95 12s 6d
BRASS Tubes (solid drawn)	lb 2s 6¾d
Sheet	ton £316 10s 0d
Wire	lb 3s 1¾d
PHOSPHOR BRONZE Wire	lb 4s 8¼d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 27¾d—28d

An Electronic Computer



THE NEW ENGLISH ELECTRIC CALCULATING MACHINE

Together with the control desk the "Deuce" occupies a floor space of 14ft by 4ft 6in

LAST week we witnessed at the Nelson Research Laboratories, Stafford, of the English Electric Co., Ltd., a demonstration of the digital electronic universal calculating engine, the "Deuce" as it is termed, which has been developed by the company. But before describing the equipment we feel it necessary to publish a statement of policy regarding the machine which has been issued by the company.

A computing centre has already been set up in the Nelson Research Laboratories and a further centre will shortly be established in London. A "Deuce" computer will be permanently situated at each of these centres, and a team of skilled mathematicians and operators will be available to offer a full computing service to organizations not requiring a machine for their own full time use. Where customers prefer to operate their own computational service the company will build the machines for installation and operation within the customer's own organization. Productive capacity for the machine has already been absorbed for 1955, but the company can now accept orders for delivery early in 1956.

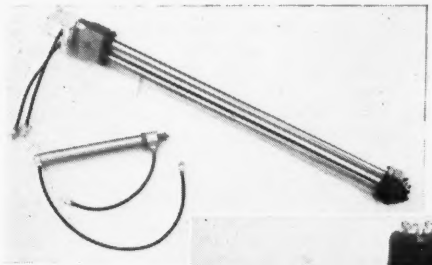
The company is also setting up a maintenance organization to provide a regular and expert service to ensure that these machines are kept in the best condition. A training service will be available, based on the two computing centres for initiating scientists, mathematicians and machine operators into the actual use of machines supplied to their organization. A library of information is also being set up in which will be recorded the programmes and sub-routines which have been worked out for the solution of problems, and this information can be made available to customers if required.

A development programme is in hand to add other information handling equipment—such as magnetic tape—to enable the machine to process different forms of mathematical and experimental data. In the future the company expects to extend the range and improve the performance of the machine and to provide a comprehensive range of data processing equipment for all kinds of scientific work.

At the outset it may be helpful to appreciate that the computer generally is a logical development of the network analyser in which the "problem" for solution, i.e. the electrical conditions of a network, is set up in the machine in the form of impedances, etc. A good example of a network analyser is that of the Electrical Research Association which was described in the *Electrical Review* of 7th May, 1954.

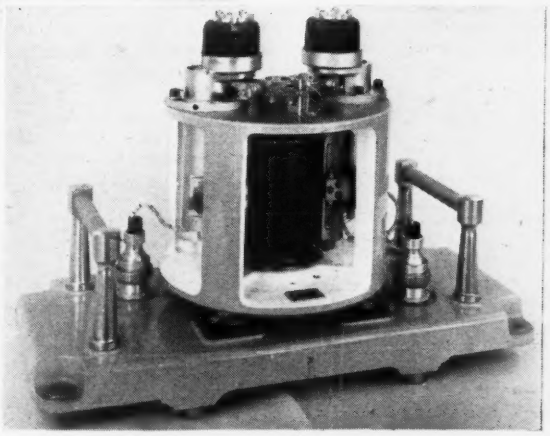
The development of the "Deuce" had its beginnings at the National Physical Laboratory about ten years ago when Sir George Nelson, chairman of the English Electric Co., was approached by Sir Charles Darwin with the request that the company should assist the scientists at the National Physical Laboratory with the development of an automatic computing engine, with the result that the pilot machine "Ace" was brought into operation in 1952.

All operations in the "Deuce" are carried out in the binary scale of arithmetic to achieve maximum reliability and economy of equipment, and numbers and instructions are represented by sequences of pulses at intervals of



Left: The first system of storage in the computer takes the form of 12 mercury delay lines; one line (enclosed tube) is shown

Below: The second storage system consists of a magnetic recording drum on which there are 256 information tracks



1 microsecond. A train (or " word ") of 32 such pulses is used to represent either a number (equivalent to 9 decimal digits with a sign) or an instruction. Two forms of storage are provided. The first is intimately associated with the computing circuits and includes 12 mercury delay lines, each storing 32 words, together with 10 shorter lines of various lengths which are used as accumulating registers, etc. The second store of large capacity (8,192 words—or more than a quarter of a million digits) is provided by a magnetic recording drum. Information can be written on or read from 256 tracks on the drum by means of two sets of 16 heads, either of which can be moved into any of 16 positions by a high-speed shifting mechanism giving access to any track in 25 milliseconds. Each " instruction word " specifies some transfer within the machine, and therefore determines the source (i.e. the position in storage, etc.) from which a number is to be extracted, and the destination to which it is to be sent. To achieve maximum speed optimum coding is used, i.e. each instruction specifies also the timing and duration of the current transfer and the position in the store from which the next instruction is to be taken.

The input and output of information is given on 80 column punched cards of standard type. Use of a card punch instead of a printer on the output enables the maximum speed of the computer to be utilized. Each input card can carry 12 instructions or up to 32 decimal digits. The latter can consist, for example, of three 9-digit numbers (each with a sign) or several smaller numbers. The input of information in sterling or other non-decimal form is also possible. The computer can convert these numbers into binary form and send them to its storage system when cards are being read at the maximum speed of 200 per minute. The reverse process is carried out at the output, the speed in this case being 100 cards per minute, corresponding to about 50 decimal digits per second.

The small physical dimensions of the computer have not been achieved by close packing of components. In fact a generous amount of space has been allowed, and the components are easily accessible for maintenance and fault tracing. The main electronic units and the magnetic store are housed in nine vertical cubicles each containing about eight chassis of convenient size. Together with the control desk the equipment occupies a floor area of 14ft by 4ft 6in. Access is by doors to the components on one side of the chassis and by a central corridor to the valves which are all on the inward facing side of each chassis. The total number of valves used is about 1,300, all being of standard miniature types and universally available.

The mercury delay lines (other than short lines of one, two or four word lengths each) are contained in a thermostatically controlled drum, 3ft in diameter and 3ft 6in high, located a convenient distance away from the main electronic units. A power supply unit takes power from the standard mains and converts it into suitable supplies for the machine. The power unit can be housed at any appropriate distance from the main machine and is remotely operated from the control desk. The input and output punched card units stand on either side of the control desk in convenient places for the operator. Since the power consumption of the computer is nearly 7 kW provision is made for connection to a forced ventilation system which removes heat from the machine and passes it directly out of the room.

The most difficult types of fault to safeguard against are those due to the slow variation of components, and these can be detected before their effect becomes harmful, by the use of the marginal checking circuits provided. There is a series of test programmes which test the operation of each part of the machine in turn. In the event of faulty operation the result obtained indicates immediately the nature of the fault. The fault can then be accurately located by application of the marginal checking facilities to individual elements of the suspected group of circuits.

Industrial Frequency Traction

THE discussion on the paper on the development of 50 c/s traction in France, which was presented before the Institution of Electrical Engineers Utilization Section on 17th February (*Electrical Review*, 18th February) was opened by Mr. C. M. Cock.

The decision for the electrification of any railway was, he said, taken on economic grounds, although not entirely. The savings due to electrification must meet the additional capital charges of expensive fixed equipment. The choice of system also depended, although not entirely, on economic conditions. He did not agree that the 50 c/s system necessarily met these requirements. High traffic density favoured the adoption of a low voltage and light traffic density a high voltage, either a.c. or d.c.

The main attraction of 50 c/s lay in the advantages of the high voltage a.c. system existing in Sweden, Switzerland and Germany and in reducing the substations to their most simple form. Some substations could be located close to the main grid supply, eliminating the cost of feeders from it to the railway system.

Against this, the cost of the a.c. locomotives was higher than that of their d.c. counterparts. He did not agree with the author about the type of motor to be used; the French were at one time enthusiastic about the 50 c/s commutator motor, but were no longer so certain about it. D.c. motors preponderated on the Thionville-Valenciennes electrification, where the proportion of rectifier-fed motors was small. In other countries, notably the U.S.A., there were large installations of rectifier-fed traction motors and similar motors had been adopted in this country. He thought rectifier-fed traction motors would become the most reliable arrangement for future 50 c/s electrification.

Apart from France, Hungary and the Black Forest, there was a 50 c/s system from Istanbul and it was to be used on part of the Lisbon-Oporto line. Electrified transport was far less vulnerable in war than steam traction. In the Netherlands, despite damage suffered during the war, the steam locomotive was being eliminated. The 50 c/s should not be considered as the complete answer for the train of tomorrow. Rather did it expand the field for electrification and make it economic where otherwise it would not be.

Mr. E. Mead complained that overhead conductor wires were unsightly and pointed out that the one extra conductor rail used by the Southern Railway was very successful. Mr. W. N. Tonkyn replied that it was generally agreed that only with voltages up to about 750 V could the ground conductor be used. At higher voltages losses due to leakage and troubles due to tracking became serious, particularly in snow. Whether the Thionville-Valenciennes line was more suitable for 50 c/s traction than for 1,500 V d.c. was controversial, but its adoption would bring valuable experience.

Mr. Davies, in reply, said the cost of the vehicle, according to the French, was not much greater than that of a similar sized locomotive for 1,500 V d.c. In France, the single-phase motor would be used for suburban high-speed services with little slow running. The d.c. driving motor was predominant in Thionville-Valenciennes, which proved its excellence. When the germanium rectifier had been perfected, even more would be heard of 50 c/s conversion, using d.c. driving motors.

Water Power and Highland Economy

Benefits Stressed in North of Scotland Board's Annual Report

BY producing 1,183 million kWh from its water power stations last year the North of Scotland Hydro-Electric Board saved the country about 700,000 tons of coal—a valuable contribution to the national economy. The Board's annual report for 1954, which gives these figures, reveals also a further large expansion in the use of electricity in the Highlands, particularly among farmers and crofters, and says there is every indication that the present high rate will continue.

Last year 1,103 million kWh was sent out from power stations to consumers in the Board's Area, an increase of 132 million kWh. This was more than could be met by the new plant commissioned during the year but supplies were assisted by the fact that the weather in the autumn was wetter than usual. Nearly 60 million kWh was used on farms, 35 per cent more than in 1953. During the year 18,893 new consumers were connected, making a total of 322,127; about three-quarters of these live in rural areas.

Progress of Construction

Three hydro-electric power stations with a total capacity of 32,700 kW were commissioned and there are now 17 in operation, while a further 20 are under construction and a number of other schemes are being surveyed. The programme of hydro-electric development has now reached the following stage:—Already in operation (including pre-war Grampian Scheme), 431,385 kW (average annual output 1,123 million kWh); under construction, 397,900 kW (1,168 million kWh); and promoted or in course of promotion or survey, 388,900 kW (1,340 million kWh). Hydro-electric power production has increased more than threefold since 1949, when the first of the stations built by the Board came into operation.

During the year 1,566 million kWh was generated from water, steam and diesel oil. The average production costs per kWh were:—Hydro-electric, 0·46d; steam, 0·84d; and diesel, 1·86d. About 75 per cent of this electricity was required for the Board's Area and 25 per cent was sold to the British Electricity Authority in Central Scotland. The maximum demand of the Board's consumers reached 314,240 kW, an increase of 29,882 kW on 1953, and the Board supplied a maximum of 214,000 kW to the B.E.A. at times of peak demand; this was 29,000 kW above the amount which it had contracted to deliver.

The Board finished the year with a net balance of £17,505. Capital expenditure during 1954 amounted to £19,852,000 and the total capital expenditure at the end of the year was £118,475,000, sub-divided approximately as follows (in £ million):—Hydro-electric schemes, 78·1; steam and diesel power stations, 3·9; transmission lines, 9·5; distribution, 25·6; and sundries, 1·3. Of the total expenditure £12,500,000 was incurred by local authority and company undertakings before they were transferred to the Board.

The number of workers employed on construction works (9,000) was about the same as in 1949. In the intervening years employment declined to between 5,000 and 6,000 in 1950 and 1951 as the result of capital cuts which set the Board's programme back by about two years.

Four dams were completed during the year; construction started on six new dams and continued on a further 17. The Trief cement plant for Cluanie and Loyne dams came into full operation. This process makes use of blast furnace slag ground very fine in place of cement and the concrete produced thereby has given more consistent results than at first estimated. Experiments with the partial replacement of cement by fly ash from pulverized fuel burning power stations continued. This process is ready for adoption but gives only a 30 per cent saving in cement as against 70 per cent with the Trief process.

Three power stations were started up during the year, and twenty are at present under construction. Of the latter, six are wholly or partly underground. Glen Moriston power station is to be placed directly below the dam at a depth of 300ft underground. The water will be taken to the power station by a vertical tunnel and from the power station to Loch Ness by a tailrace tunnel 20ft in diameter and four miles long. One of the advantages of this type of development is that the tunnel is unlined whereas with the normal pressure tunnel a concrete lining is required. In the Glen Moriston power station and in Ceannacroc power station, which is also underground, it is intended to leave the rock walls unlined and by suitable illumination provide a daylight effect and bring out the colour of the rock.

Steam Plant Operation

The Board's steam plant at Dundee and Aberdeen operated during the year to fit in with the varying output from the hydro plants. The total number of kWh generated was 328 million, a decrease of 10 per cent compared with the unavoidably high output of 364 million in 1953. The flexibility of a combined hydro and steam generating system is illustrated by the difference between the maximum steam station output of 41·3 million kWh in the dry month of February and the minimum of 10·2 million in the very wet month of October. During October, November and December both steam stations were shut down simultaneously for 19 days and the Aberdeen station for a further 17 days.

All but nine of the diesel stations have been relegated to stand-by or reduced duty as a result of hydro-electric development and interconnection with the main system. Seven of the nine are on islands where there is a deficiency of potential water power.

There are now 1,130 circuit miles of 132 kV lines in commission, a further 200 circuit miles are being erected and surveys for other future lines are being carried out. The operating control centre of the main group of generating stations and the high voltage transmission system is at present temporarily at Errochty but a permanent centre is being established at Port-na-Craig House, Pitlochry.

The cost of connecting new consumers last year averaged £184 against £156 in 1953. The Board continued to press ahead with the supply of electricity to the isolated rural parts of its Area which are being supplied by comprehensive distribution schemes.

There has been an increase of 12½ per cent in the price of coal since 1952 and several increases in the nationally agreed rates of salaries and wages but so far the Board has been able to avoid any increases in charges.

During the year 10,137 electric cookers were installed

in the Board's Area, more than double the number installed during 1949. The report says that freedom of choice by tenants of local authority housing schemes to cook by the appliance they prefer is welcomed by the Board and consumers alike. In Aberdeen, for example, only gas cookers were installed up to four years ago. A freedom of choice scheme was then started and during the first year 13·8 per cent of the tenants elected to cook by electricity, while during the fourth year (1954) 58·8 per cent so elected, a clear proof of the attractiveness of cooking by electricity.

Agriculture is the most important industry in the North of Scotland, and increased productivity is of the highest importance. The Board reports that 1,680 farms and 1,664 crofts were connected to the Board's mains during 1954—a record number. There are 19,300 farms in the Area and of these 7,953 (41·2 per cent) are now served. Out of 21,800 crofts in the Area, 10,230 (46·9 per cent) have been connected.

The harvesting of good quality grass and hay crops by traditional methods is difficult in many districts, particularly where rainfall is heavy and unpredictable. There are now eight electrically operated dryers in the Highlands securing good grass and hay crops. A new plant was installed at New Keig, Alford, Aberdeenshire, and 20 tons of grass and 130 tons of grain were dried in it. Experiments continued on a community hay dryer at Plockton, Ross-shire, and the crofters' experience is evidently satisfactory because all who dried their hay in the past co-operated again last year.

At the experimental peat power station at Altnabreac in Caithness the principal work carried out during the year was the erection of the main workshop and office building and the cutting of about 40 miles of drainage ditches. John Brown & Co. (Clydebank), Ltd., have completed the design of the 2,000 kW gas turbine and materials for its manufacture are on order. The erection of the Dundee gas turbine was completed and several days' trial, running light, were carried out. A number of mechanical troubles which developed are being dealt with but unfortunately an electrical breakdown of the alternator has postponed running on load.

More mechanical adjustments of the 100 kW experimental windmill at Costa Head in Orkney were completed during the summer and intermittent operating trials were conducted.

Hydro-Electric Schemes Still Needed

AT a Press conference in Edinburgh last week Mr. Thomas Lawrie, general manager of the North of Scotland Hydro-Electric Board, said that the suggestion that future hydro-electric construction in Scotland should be abandoned because of the coming of nuclear power stations was not warranted by anything in the White Paper. On the contrary, a tenfold expansion of hydro-electric power and pumped storage in the next twenty years was envisaged. Far from the existing hydro-electric undertakings contributing only minutely to the electricity pool as a whole, the White Paper forecast that by 1975 there would be some 2,000 to 4,000 MW of hydro-electric and pumped storage plant and 10,000 to 15,000 MW of nuclear power plant, so that the total hydro-electric capacity would then be about one-quarter to one-fifth of the nuclear power plant installed in the whole of Great Britain. The nuclear power plant would be base load plant and the hydro-electric plant would be mostly peak load plant.

There was, of course, ultimately a limit to the harnessing of water-power resources of the Hydro Board's area, but that limit was not yet in sight. At present, about 10 per cent of the potential water power of the Highlands was harnessed and another 20 per cent was under construction and survey, upon which the Hydro Board expected to be occupied until about 1963-65. The resources of pumped storage in the Highlands had not yet been tapped, because the Board had been too busy with the development of ordinary hydro schemes and the distribution of electricity. Nuclear power stations apparently had to run at a steady load day and night, consequently the need for other means of meeting peak load power would become more and more important. The Sloy power station was an outstanding example of a valuable peak load hydro-electric station and the service it provided might need to be multiplied many times over. It would not be difficult in fact to build a pumped storage station of large size alongside the present Sloy power station, pumping the water of Loch Lomond up to Loch Sloy at night by means of nuclear power and using it to drive turbines by day at times of peak load. But for hydro-electric power it would not have been possible to distribute electricity in the North of Scotland on anything like the present scale.

RECENT E.R.A. REPORTS

THE British Electrical and Allied Industries Research Association has recently issued a number of reports of interest to electrical engineers. These are summarized as follows:—

Capacitive Spark Discharges.—The work described in Refs. G/T253 and G/T278 has been continued in this report, Ref. G/T 293, "The Effect of Series Resistance on the Characteristics of Capacitive Spark Discharges." A new technique of measurement involving the use of a potential divider has enabled discharge characteristics and discharge energies to be measured over a range of circuit resistance up to 38,000 ohms and for discharges with durations as short as 8×10^{-8} sec. When the spark-gap is fitted with tungsten electrodes, the discharge energy decreases with increase in resistance over the whole range of resistance, but with steel electrodes the energy increases again for resistances above 11,000 ohms. For resistances between 200 ohms and 11,000 ohms the discharge energies are greater for tungsten electrodes. There is a slight knee in the discharge energy resistance curve at the value of resistance which corresponds to the minimum discharge duration. The work is by H. G. Riddlestone, B.Sc.(Eng.), A.M.I.E.E., and costs 10s 6d.

Altitude Correction Factors.—Altitude correction factors for sparkover voltages of insulators and rod gaps involve the variation of the density of the atmosphere with altitude and sparkover voltage as a function of air density. The atmospheric density variation is calculated for the I.C.A.O. standard atmosphere.

Report Ref. L/T311 (10s 6d), by A. Morris Thomas, B.Sc., F.Inst.P., M.I.E.E., shows that in accordance with Paschen's Law sparkover voltage is not, in general, directly proportional to air density and the air density correction depends to some extent on a linear dimension of the system. For practical purposes, however, a 0·75 power law provides a basis for the estimation of altitude correction factors.

Recently it has been proposed that the standard altitude correction factor should be such that the normal standard test voltages at sea level should be increased by 3·5 per cent for each 1,000ft in excess of 3,300ft for insulators and air clearances designed for service at high altitudes. It is suggested that this proposal needs reconsideration as it yields test voltages which are too high by several per cent.

Thunderstorms and Fuses.—A report, Ref. S/T61 (price 6s), by J. L. Miller, Ph.D., B.Sc., Grad.I.E.E., "Blowing of Fuses in Distribution Systems During Thunderstorms," summarizes the published information and examines in some detail the various probable causes to which fuse blowing may be due.

Air-Blast Circuit Breakers.—Report Ref. G/T288 (price 10s 6d), by F. Oliver Mason, B.Sc.(Eng.), A.M.I.E.E., continues the study of variation in repeat tests experienced with an experimental air-blast breaker at the E.R.A. Laboratory, and describes the form of distribution obtained from a large number of tests at blast pressures below the working pressure for the circuit in question.

Austrian Railway Electrification

Prospects for United Kingdom Manufacturers

By R. E. KAAN, Dipl.Ing.

THE lack of sufficient local coal deposits in the country, and the immense hydro-electric potentialities, induced the Austrian Federal Railways in 1919 to start on an extensive railway electrification programme. Existing railway electrifications in the neighbouring countries, Switzerland and Germany, mountainous railway tracks with heavy international traffic, and cheap electricity supply, were the main reasons for starting the scheme at the most western frontier, Switzerland, and gradually proceeding eastward.

The following table shows the electrification achievements from 1918 to 1953:—

Table 1.—Progress of electrification

Year	Length in km	Proportion of total (6,026 km) (per cent)
1918	215	3·5
1930	836	13·8
1945	1,000	16·6
1952	1,340	22·2
1953	1,430	23·5

The use of direct current proved to be uneconomical in view of the mountainous character of the country with many steep gradients, apart from the expenditure for distribution and conversion. In 1912, Austria, Germany, Switzerland, Sweden and Norway agreed to use the 15 kV, 16⅔ c/s single-phase a.c. system for railways, the main advantages being the use of high voltage, thereby reducing the size and weight of the overhead wire and supporting structures, and the wider spacing of the substations. Moreover the latter were only transformer and switch stations, and not convertor stations.

The supply in 1952 was provided by seven railway-owned power stations, with a total annual capacity of 430 million kWh, three stations owned by the electricity authorities, with an annual output of 49 million kWh, 17 stationary and three mobile substations (see map).

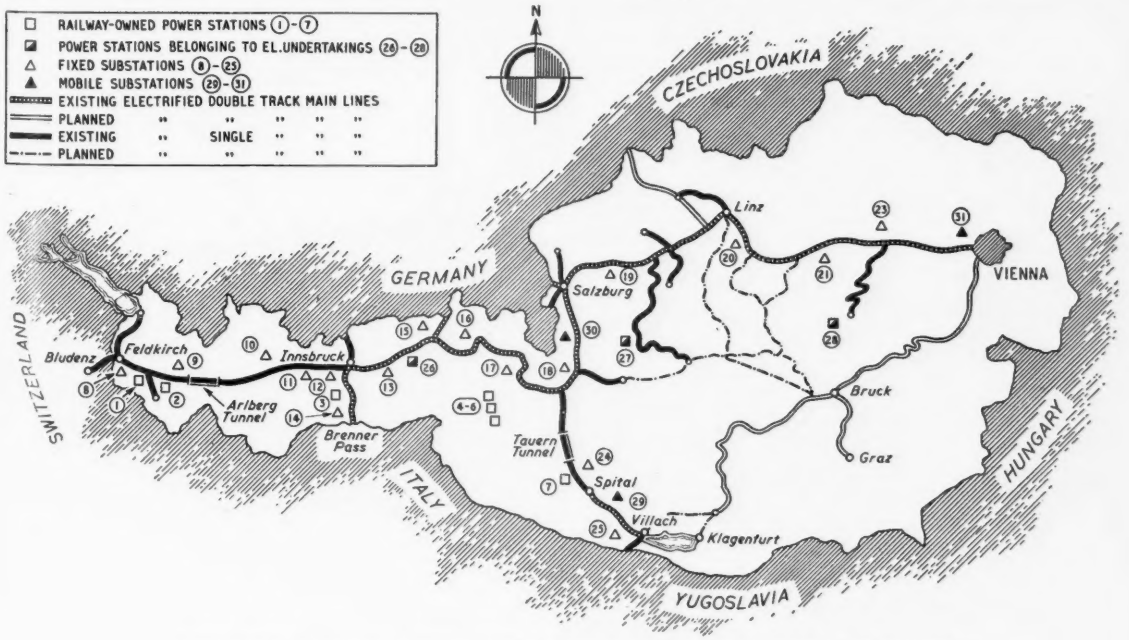
The standard overhead equipment of Austria's main lines consists of copper contact wires (100 mm²). In order to avoid undue wear on the pantograph power collector, the wires are suspended in horizontal saw tooth form with ± 400 mm deviation from the central railway line.

In order to meet the demand of heavier and faster traffic, the locomotive traction power and speed have been increased considerably. While the first Austrian electric locomotive, built in 1911, had a tractive power of 10·4 tons (420 kW output) and a maximum speed of 40 km/h, the present locomotives are designed for 26 tons (4,100 kW) and 130 km/h maximum speed. The following table gives the operating data of some locomotives:—

Table 2.—Operating data of Austrian electric locomotives

Type	Year	Weight (tons)	Output (kW)	At km/h	Max.speed km/h
C-C	1911	49·4	420	28	40
ICI	1923	74·1	1,040	50	75
E	1927	82·0	1,500	38	50
BO-BO	1929	72·0	1,300	44	70
(IA)Bo(IA)	1932	112·0	2,300	69	100
IDol	1940	110·0	3,500	98	130
Bo-Bo	1950 52	82·0	2,360	63	90
Co-Co	1953	102·0	4,100	90	130

Austria having a formidable electrical industry, is not only self-supplying, but is in a position to export a considerable amount of electric traction equipment. Possibilities for British exporters of electric railway equipment will therefore be restricted. Export openings should include certain types of railway telecommunication equipment, signalling apparatus, cables and instruments.



Austria and its neighbours, showing the extent of railway electrification accomplished and projected

INDUSTRIAL NEWS

English Electric Plant for St. Lawrence Project

The Hydro-Electric Power Commission of Ontario has placed with the John Inglis Co., of Toronto, Ontario, the Canadian associates of the English Electric Co., Ltd., an order for sixteen 75,000 h.p. fixed propeller type water turbines. The value of this contract amounts to $7\frac{1}{2}$ million and is one of the largest orders of its type ever to be placed with one concern. It comprises the complete turbine installation on the Canadian side of the St. Lawrence water power project. The equipment will be manufactured at the company's works in Toronto to the designs of the English Electric Co., Ltd., England.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 12th February is deemed to be 150s 6d. The cost of material figures are:—

For electrical machinery and equipment the Board of Trade index figure published on 12th February is 173·4.

For turbo-generating and allied plant: Materials used in mechanical engineering industries, 159·0, blast furnaces and iron and steel smelting and rolling (40 and 41), 146·9. The price of $\frac{3}{4}$in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 11th February) is 4s $4\frac{1}{8}$d per lb. Outstanding contracts covered by the B.O.T. intermediate products index: The index figure for intermediate products (12th February) is 372·6.

Time Switches for New Zealand

An order for 12,000 washing machine time switches specially designed for the New Zealand market has been received by Venner, Ltd., from its Wellington agents, Jas. J. Niven & Co., Ltd. These will be incorporated in a new type of washing machine manufactured in New Zealand which the makers claim will be the first machine to bridge the gap between the expensive fully automatic type and the standard washer which has a powered wringer and pump.

Australian Cable Order

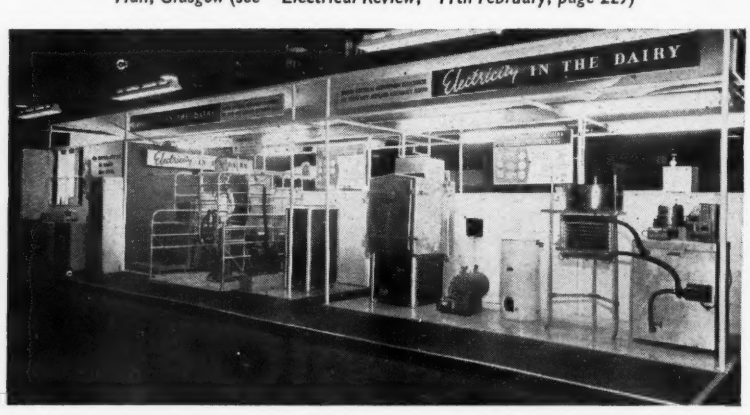
British Insulated Callender's Cables, Ltd., has received a substantial order from the Electricity Commission of New South Wales, Australia. It is for the supply of 30,000 yd of h.v. cable to form a double-circuit $8\frac{1}{2}$ mile link between Bunnerong power station and the Canterbury substation in Sydney and it is expected that the cable will be in operation early next year.

The cable chosen is a 3-core 132,000 V impregnated pressure cable which will be manufactured in England although its installation and maintenance will be carried out by an affiliated Australian company, British Insulated Callender's Cables (Australia) Pty., Ltd. The route is in the Sydney metropolitan area, the cables having to run through heavily built-up districts.

North Western Board Exhibitions

"Try It Yourself" exhibitions, which proved so successful when promoted by the North Western Electricity Board last winter, are again bringing the crowds this winter. About forty of the fifty exhibitions planned for this season have been held, bringing the total since they were begun to nearly eighty. At these exhibitions all types of electrical domestic apparatus are on show and housewives and handymen are invited to walk around at their leisure and operate the various appliances. As last year, set pieces planned by the Board's display section to hold the appliances are circulating among the Board's seven Sub-Areas, and these are being adapted to suit the type of room available, whether it be town, village or school hall, or some other building. Great interest has been shown at these exhibitions in clock-controlled cooking, and special demonstrations of this have been staged at many places.

The combined display by the Electrical Development Association and the South West Scotland Electricity Board at last week's Scottish Dairy Show held at Kelvin Hall, Glasgow (see "Electrical Review," 11th February, page 229)



Building Blocks from Fly Ash

Within the next three months a factory will be turning into building blocks every week 500 tons of fly ash waste from Braehead power station, Glasgow. The factory is being built beside the power station for Melcrete (Scotland), Ltd.

Water Heating Display Unit

The Hotpoint Electric Appliance Co., Ltd., has prepared a new water heating display background which is being distributed by the company's district offices. The basic colour is a rich blue on which the water splashes depict the hot water in use, and the threepenny piece is authentically coloured.

New water heating sales aid

Smoke Abatement Society

The proceedings of the Scarborough Conference of the National Smoke Abatement Society held in September last have now been published in book form. These include the paper presented by Mr. J. I. Bernard, of E.D.A., on the industrial uses of electricity. Copies of the proceedings can be obtained from the Society, 30, Grosvenor Place, London, S.W.1, price 7s 6d.

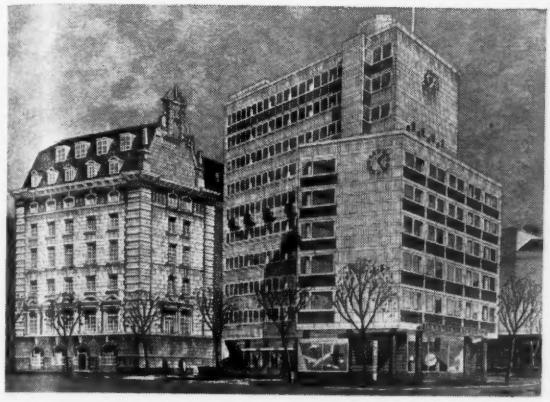
Decimal Currency Bill

The text has been published of Mr. M. Follick's Decimal Currency Bill, which is being sponsored by a

number of M.P.s of all parties. The Bill provides for the setting up of a Commission to inquire how best to introduce a decimal currency in the United Kingdom.

New English Electric Premises

The English Electric Co., Ltd., has announced that the winners of the architectural competition for the design of a new office building on the site



The winning design by Mr. Gordon T. Tait in the architectural competition for a new office building for the English Electric Co., Ltd., on the site of the old Gaiety Theatre, Strand

of the old Gaiety Theatre are Sir John Burnet, Tait & Partners (Mr. Gordon T. Tait, F.R.I.B.A.). Those invited to take part in the competition were Mr. David du R. Aberdeen & Partners; Adams, Holden & Pearson; Sir John Burnet, Tait & Partners; Farmer & Dark; Farquharson & McMorran; Mr. Michael Rosenaur; Louis de Soissons; Mr. Basil Spence & Partners; and Yorke, Rosenberg & Mardall. The competition was held under the rules of the Royal Institute of British Architects, and the assessors were Sir Percy Thomas, past president of the Royal Institute of British Architects, M.T.P.I., and Mr. J. M. Easton, F.R.I.B.A.

Eastern Board Management Conference

Speaking at a management conference held in Clacton on 18th February, Mr. C. T. Melling, chairman of the Eastern Electricity Board, said that a good manager must have not only personality, knowledge and experience but also training, and the conference was one way by which the Eastern Electricity Board was providing for the future of good management. Mr. Melling was dealing with the various administrative questions raised, and speaking about the current aspects of the Board's policy and work at the last of the eight management conferences held by the Board this winter.

Caroline Haslett Trust

The Caroline Haslett Trust, established in 1945, awards annually scholarships to enable girls to take a domestic science training at a recognized college prior to embarking upon careers in the electrical industry. The following five scholarships have just been awarded, bringing the total number to 54:—Miss Sheila Rigby (Bolton), Miss Patricia Smith (Eccleshill, Bradford), Miss Ann Clements (Welwyn, Herts), Miss Valerie Miles (Solihull, Birmingham) and Miss Gillian Golden (Woldingham, Surrey). The Trust also awards each year a Travelling Exhibition to an electrical housecraft adviser to study domestic electrification abroad. The tenth holder, Miss M. J. Cumming, of Glasgow, will be giving a lecture on her investigations in Finland at the Institution of Electrical Engineers on 22nd March.

E.T.U. Strike Ballot

A ballot is to be held among members of the Electrical Trades Union to decide whether strike action shall be resorted to in support of the Union's claim for a wage increase for its members in the electrical contracting industry. Recently it was reported that the National Federated Electrical Association had made an offer of 2d an hour in settlement of the claim. This the Union's Executive considers to be "totally inadequate," saying that it would leave the hourly rate of the skilled electrician in the contracting industry below that of a number of semi-skilled workers in the electricity supply industry. It states that for at least thirty years electricians in the contracting industry have been paid more than those employed in electricity supply.

Member Expelled

Mr. M. Benson, who has refused to pay a £20 fine imposed by the Executive of the Electrical Trades Union, was told by his local branch last week that his expulsion from the union must automatically take place. Mr. Benson was one of three members of the Union who were fined by the Executive for returning to work without instructions, in a dispute with J. Lyons & Co. last year. He was fined £20, suspended from eligibility for all cash benefits for five years, and deprived of the right to stand for office for five years.

G.E.C. Atomic Energy Plans

The General Electric Co., Ltd., has announced that Mr. R. N. Miller, formerly chief mechanical engineer to the British General Electric Co., Ltd., of Australia, has been appointed to take charge of its newly formed industrial atomic energy section, which includes engineers, physicists and metallurgists trained at Harwell. The new organization which is at the company's Erith (Kent) works will develop designs of plant for the utilization of atomic energy in power station generating equipment. The company intends to provide most of the equipment, including the pile for atomic power stations, from within its own manufacturing organization.

Works Visit

Vice-Admiral Sir Ralph Edwards, Third Sea Lord and Controller of the Navy, visited three Norwich works of Laurence, Scott & Electromotors, Ltd., on 14th February. In company

Third Sea Lord's visit to the works of Laurence, Scott & Electromotors, Ltd., showing (left to right) Sir Hamish MacLaren (Director of Electrical Engineering, Admiralty), Vice-Admiral Sir Ralph Edwards (Third Sea Lord and Controller of the Navy), Mr. K. Worship (general manager, Thorpe Road works), Mr. G. H. Wilson (managing director), and Mr. R. Clarke (marine director)

with Sir Hamish MacLaren, Director of Electrical Engineering for the Admiralty, he made a general survey of the various types of electrical apparatus in course of manufacture for the Admiralty.

Commercial Catering Course

The first commercial catering course to be organized by the Electrical Development Association, took place at Horsley Towers, Surrey, from 21st to 23rd February, and was attended by representatives of most of the Electricity Boards in the United Kingdom and of a number of manufacturers of electric equipment. The number attending the Conference was dictated by the residential accommodation available. Accordingly it was decided to make it a pilot course restricted to the staffs of the Eastern, London, Southern, South Eastern and South Western Electricity Boards with observers from the other Electricity Boards. Delegates were welcomed by Mr. T. J. Roberts, resident tutor at Horsley Towers and the conference was opened with an introductory address by Mr. H. G. Gamble, of the Eastern Electricity Board, who is chairman of the E.D.A./B.E.A.M.A. Commercial Catering Committee. Thereafter four papers were delivered on "Main Cooking Equipment" by Mr. A. L. Mitchell (G.E.C.), on "Service and Snack Bar Equipment" by Mr. R. Goodwin (Gardiner & Gulland), on "Food Preparation" by Mr. E. C. Simmonds (Euk) and "Aids to Hygiene and Cleanliness" by Mr. H. Bodlander (Euk Catering Machinery).

On Tuesday papers were given by Mr. R. Crafter (James Stott & Co.) on "Kitchen and Service Planning," by Mr. L. H. Willis (North Western and Merseyside and North Wales Division, B.E.A.) on "Running a Large Kitchen," by Mr. H. H. Wood (Midlands Electricity Board) on "Selling Commercial Catering," and by Mr. E. M. Ackery (E.D.A.) on "The Consumption of Electricity and Cost Comparisons." "Operational Comparisons" was the subject of an address on Wednesday by Mr. L. H. Carmalt (Simplex Electric Co.). This was followed by a talk on "Care, Use and Maintenance of Electric Cooking Equipment" by Mr. H. K. Tomkins and Mrs. Scallan (Jackson Electric Stove Co.).

In the evenings the 30 students met in five discussion groups to debate the papers. A wide range of electric catering equipment was also on display.

Electrical Progress—1954

The General Electric Co., Ltd., asks us to make it clear that Fraser & Chalmers Engineering Works supplied the mechanical parts for the single drum winders at Bold Colliery and of the Koepe winders at Bradford (Manchester) Colliery, mentioned in their review of progress (4th February issue). The Metropolitan-Vickers Electrical Co., Ltd., were the main contractors.

Trade Announcements

Birlec, Ltd., announces the following new addresses for its London area and Newcastle-upon-Tyne offices:—London area office: "Ediswan House," 155-161, Charing Cross Road, London, W.C.1 (telephone: Gerrard 8660). Newcastle-upon-Tyne office: c/o The British Thomson-Houston Co., Ltd., 9, Higham Place, Newcastle-upon-Tyne, 1 (telephone: Newcastle 25040). Mr. S. G. King is the manager of the London area and Mr. J. W. Payne resident sales and service engineer in Newcastle-upon-Tyne.

The Thermovent Heating Division of **E. K. Cole, Ltd.,** announces the appointment of Mr. R. E. G. Durham as technical sales representative for the Midlands area. Mr. Durham, who succeeds Mr. B. I. Nealon, is operating from the company's Birmingham depot at 11, Brook Street (telephone: Central 2505).

Teddington Industrial Equipment, Ltd., announces the appointment of **MacCarthy & Co. (Engineers), Ltd.,** 12, Grey Street, Newcastle-on-Tyne, as distributors and technical representatives for its industrial control equipment in the North-East, covering the counties of Northumberland and Durham and the county borough of Middlesbrough.

Birmingham Electric Club

A proposal is being considered by the Birmingham Electric Club for abolishing the limitation of 650 on its membership as increased accommodation is now available for its meetings.

Electrical Commercial Travellers

There was a record attendance of 650 at the annual luncheon of the Electrical Trades' Commercial Travellers' Association held at the Connaught Rooms, London, on Friday last under the chairmanship of Mr. J. H. Bowen.

As is customary, the speech-making opened with an appeal by Mr. S. Johnson (charity steward), supported by Mr. A. T. Haywood (president), on behalf of the Association's charities, which include contributions to the Royal Commercial Travellers' Schools, the Electrical Industries Benevolent Association and the I.E.E. Benevolent Fund. Mr. Johnson mentioned that the Association had this year given over £400 to these bodies.

The toast of the Association was proposed by Mr. W. S. Lewis, chairman of the Midlands Electricity Board, who said that commercial travellers had suffered hardship in the past in trying to sell electrical equipment, but now with the advent of the B.E.A. the whole picture had been changed. They were engaged in an expanding industry of high quality goods which was able to give a service to the public second to none. After complimenting the Association on its charitable work, Mr. Lewis, as a member of a State controlled Board, thanked the representatives of private enterprise who had rendered such wonderful service during the past seven years. During the first six years, the number of consumers had increased by 2,670,000, making a total at the end of March, 1954, of 14·4 million. In the Midlands area they had added 53,000 new consumers (including over 8,000 farms). The maximum demand in the first year was 1,121 MW, and this year to date it had reached 1,777 MW without load shedding. He referred to the recently announced railway modernization plan and the Government White Paper on nuclear power stations and said that the electrical industry could do more than most to keep us in the forefront of world progress.

Mr. Haywood, in responding, said that on 14th February a new baby had been born in the formation of a Manchester Branch of the Association. He, with Mr. Bowen, had attended a meeting there at which over 100 electrical representatives were present and at which sixty-four members were enrolled. Mr. Haywood announced that as a result of a collection made during the luncheon £162 had been raised for the Association's charities.

Mr. Bowen, in proposing the toast of the guests said that the members of the Association were men of the highest integrity. To employers he would say: "Give your travellers the goods and they will sell them." Mr. W. Crisp (president, Electrical Wholesalers' Federation) responded.

At the luncheon of the Electrical Trades' Commercial Travellers' Association. Left to right: Messrs. W. Crisp, A. T. Haywood, J. H. Bowen and W. S. Lewis

Alternator Failures

Toronto Investigation Report Discussed

THE presentation of a "Report on Investigation into the Failure of Two 100 MW Turbo-Generators" by Sir Claude Gibb before the Institution of Mechanical Engineers on 15th February (*Electrical Review*, 18th February) was followed by a discussion. In a written contribution, Mr. V. A. Pask said in regard to 100 to 120 MW sets with large diameter rotors, the British Electricity Authority had given a definite direction to manufacturers that no ventilation holes were to be drilled in the bell (containing ring) and said that they should also be avoided on the 60 MW frame. The 60 MW sets might be subjected to some 50 to 283 starts and stops per annum, and shut-down periods varied from 6 hours to 36 hours, or longer. By a simple adjustment of the control valves associated with the dirty and clean water heat exchangers, the re-cooled hydrogen temperature might be raised to 80 or 85 deg F before shut-down. That temperature would not drop by more than 3 to 5 deg F during even a 36 to 42 hour shut-down on a normally lagged alternator casing in stations located in the fresh water reaches of a river in even the coldest winter period. The Authority was providing additional air-conditioned accommodation at all sites where unavoidable delays in civil construction works might involve storage of a rotor.

Mr. V. J. Vickers agreed with the author's estimate of the increase in average temperature rise of the rotor winding as the result of omitting ventilation holes. He considered their retention unnecessary to prevent coil distortion. The use of semi-hard silver bearing copper could give ample margin of safety at the slightly higher temperatures resulting from the omission of holes, because the increase in temperature would be largely localized in the end turns and would not substantially increase the stress in the copper in the slots, where the forces giving rise to the stresses leading to deformation were most significant.

Ring Design

Mr. Harry West showed slides of a ring design which his company adopted in 1928. The ring was completely free from holes, notches, or any forms of stress, and was as far as possible uniform in section. Some 800 rings had been in service successfully on air-cooled machines. Rings had been installed in a two-shift station for the last ten years.

Professor G. W. Austin observed that the retaining of adequate ductility and the possible introduction of the notch bar test would be a safeguard. He preferred a softer, tougher material to a material which had been worked to the limit of its ductility.

Dr. Charles Sykes suggested that the internal stress set up in the immediate vicinity of the hole due to the drilling should be considered. The data recorded in the paper indicated that all forms of notch should be eliminated and that the shrink fit stress should be kept as low as possible in order to provide the maximum margin of safety against various types of fatigue load in service.

Mr. L. E. Benson referred to the serious weakening effect of a drilled hole in austenitic steel. This effect could arise through stress concentration, strain hardening effect (which limited ductility), and possibly local heating during drilling which, if severe, could leave the surface material in a state of initial tension when cooled down again.

Mr. J. T. Moore emphasized that with cold-worked non-magnetic material used in end bells the ratio of yield to ultimate stress was of vital importance and should be the subject of a national standard, which could be the forerunner of an international standard.

Need for Further Research

Mr. F. Shakeshaft said that experience already gained from semi-direct cooling of the winding in the rotor slots, together with the evidence in the paper, indicated the need for additional metallurgical and heat transmission research work. He advocated the making of an exhaustive investigation into mechanical design details before new large capacity alternators entered the manufacturing stage. The application of semi-direct cooling to the rotor body winding had already shown the importance of adjusting the hydrogen flow through individual bars so as to avoid uneven cooling of the rotor body, which resulted in its bending and consequent heavy mechanical vibration.

Mr. L. W. James, referring to the statement that drilling holes in the end rings gave a 7 to 15 deg C reduction in rotor temperature, pointed out that the temperature of the coil in the centre of the rotor body would be much higher than in the well-cooled end portions. That type of cooling might be expected to give, for the same average temperature rise, much more risk of copper shortening than the more normal type of rotor with a well ventilated body and slots. The new design of direct cooled rotor should give a more even temperature.

Dr. H. E. Davies referred to the unfortunate necessity of reliance on cold working (with the resultant internal stresses in the material) to obtain the requisite mechanical properties of end bell steel, since the bell thus became susceptible both to stress corrosion and to brittle fracture.

Mr. A. W. C. Hirst suggested making tests on end bells of similar design to see the effect of their diameters. Possibly piecemeal results were already available to individual manufacturers that could be co-ordinated into some sort of composite picture.

Servo-Mechanisms

IN the discussion on Mr. P. J. Bhatt's paper on Servo-Mechanisms, read before the Institution of Electrical Engineers Utilization Section on 17th February (*Electrical Review*, 18th February), Dr. J. H. Westcott referred to their wide range of applications, which covered not only such mechanical quantities as alignment, velocity and acceleration but also tensions, thicknesses, pressures and torsions. In process control (temperature, pressure and flow) the problems seemed to be at their worst, but the flexibility of the electrical medium would lead to its increasing application. The text books mentioned in the paper were all from the United States, but the British books, of which a reasonable selection was available, were "easier going" and more suited to our methods of teaching.

Dealing with future applications, Dr. Westcott said that in most chemical processes there were several variables, related by their connection through a complicated chemical reaction. He looked forward to the day when they could be tackled together, as a unit, and that was where the flexibility of the electrical medium would be important.

PARLIAMENTARY REPORT

SOME indication of what the Government's Clean Air Bill will contain was given to the House of Lords last week when the Beaver Committee's Report was debated.

The Earl of Munster, Minister without Portfolio, said that the Government had already made a decision to include six of the Committee's proposals in the new Bill. These were that, subject to certain exceptions, the emission of dark smoke should be prohibited; that industries which installed new plant, burning pulverized fuel or large amounts of solid fuel, should take all possible steps to prevent the emission of grit and dust; that local authorities should be given powers to designate smokeless areas, subject to confirmation by the Government; that the main duty of inspection and enforcement should be placed on local authorities; that householders in these designated areas should be obliged to convert their domestic grates to burn smokeless fuel, a portion of the conversion cost being met by the Exchequer and local authorities; and that the Government loan scheme for approved fuel-saving equipment in industry should be extended to include any equipment installed to reduce air pollution. Other proposals would require further consideration. The success of the Bill would depend on the production of sufficient quantities of smokeless fuels. During the next few years the heating of public buildings would be converted from coke to oil, making a saving of 2½ million tons a year. This coke could in the future be used in the smokeless zones.

Earlier the House had heard from Lord Douglas of Barloch that the repair of the stonework of the Houses of Parliament, corroded by pollutants in the air, had already cost far more than the original cost of erecting them. Commenting on this, the Earl of Munster said that the Beaver Committee suggested that the most efficient method of removing sulphur dioxide from flue gases should be adopted at all new power stations to be built in or near heavily populated areas. The Government was quite prepared to accept that in principle, but there were a number of technical and economic difficulties to be overcome. The Beaver Report referred to some of these and recommended that research and development work should be speeded up. These recommendations did not require legislation, and action was being taken. The British Electricity Authority was putting up a pilot scheme in the Midlands to carry out large-scale trials into a cheaper process of reducing sulphur pollution. This process produced sulphate ammonia as an end product. The plant which was to be erected would produce 50 million cubic feet of flue gases per day, so that this experiment would be on a satisfactory and adequate scale.

The Department of Scientific and Industrial Research had made arrangements for more recording instruments to be installed in the London area and in several provincial towns in order to take frequent measurements of all kinds of air pollution. The Fuel Research Station had also installed 20 additional instruments in London. The Committee requested that there should be an intensification of research into reducing the amount of sulphur in fuel and the prevention of the release of sulphur into the air. Many experiments had been made but they had not been a great success. New efforts were being made. The question of setting up a Clean Air Council was now receiving the attention of the Government.

Standard Screw Threads

In the House of Commons last week Mr. Mitchison asked the President of the Board of Trade what steps were being taken to adopt uniform international threads in the interests of the export trade.

Mr. Henry Strauss replied that there were three standard types in this country, including a unified thread recently introduced by agreement between the United States, Canada and Great Britain. Two of these were in use abroad. The British Standards Institution, with the full co-operation of industry, was engaged in international discussions designed to secure wider agreement on an international standard.

Anglo-Brazilian Trade

Commander J. F. W. Maitland asked the President of the Board of Trade what proposals he had for improving Anglo-Brazilian trade and for inviting a group of Brazilian exporters to this country to enable them to study the British market.

Mr. Peter Thorneycroft said that this trade was passing through a difficult period. In recent discussions in Rio de Janeiro the Brazilian authorities agreed that greater flexibility in payments arrangements was desirable in order to afford a basis for increasing trade. The main factor, however, was Brazil's ability to sell her goods in this country and the Government had freed nearly all Brazilian goods from import restriction. If the Brazilian authorities decided to send a trade mission, the Government would afford it every facility and assistance in establishing the necessary contacts.

Electric Cable Prices

Mr. Palmer asked the Minister of Supply if he was satisfied that the cable making associations had brought their trading arrangements into conformity with the conclusions of the Monopolies Commission by 31st December last as requested by the Government; if they had now furnished the Government with information about the relationship between the prices charged to the British Electricity Authority and those charged to other users of electric cables in those type ranges where the Monopolies Commission reported that no competition existed; if the associations of manufacturers of telephone cables had yet furnished the Government with information about the prices charged to general users and those charged to the General Post Office, based on cost investigation; and if he would state what action he had taken.

Mr. Selwyn Lloyd replied that the Cable Makers' Association and the Covered Conductors' Association had assured him that they had, as requested by the Government, brought their arrangements, as from 1st January, 1955, into conformity with the Commission's conclusions, subject to the two reservations explained in the statement of 20th May by the Minister's predecessor.

The Cable Makers' Association had also assured him that prices charged to users other than the B.E.A. for mains and super-voltage cable had borne and would continue to bear a direct and reasonable relationship to those charged to the B.E.A. As regards telephone cable, the Association stated that it was still negotiating prices with the General Post Office.

Mr. Palmer asked if the Minister would make the new arrangements available to the House so that they could judge whether the Government was really in earnest in fighting the monopoly practices in British industry.

Mr. Lloyd said he could not answer at this stage. The associations had given an assurance that they were acting in the way described. It would be for him, at an appropriate time, to review these arrangements. Then he would have to consider the question of giving information to the public and to the House.

Mr. Charles Orr-Ewing asked whether, when the negotiations took place between the cable makers and the Post Office, they would see an end of the ring with which the Post Office had been dealing for many years, so that it would be possible for non-ring manufacturers to enter this important field.

Mr. Lloyd thought it would be better to see the result of the negotiations before making any statement on this subject.

Gas and Electricity Meters

Mr. Arthur Lewis asked the Minister of Fuel and Power if he would give a general direction to the British Electricity Authority and the Area Gas Boards to consider jointly the advisability of introducing a meter, in all premises using gas and electricity, which would measure the consumption of gas and electricity on the one meter, and thus save the necessity of employing two meter readers.

Mr. Joynson-Hicks, Parliamentary Secretary, Ministry of Fuel and Power, replied that such a service would not be practicable.

GENERATION AND DEVELOPMENT

Record Output in January

Electricity output in January was higher than in any previous month. Altogether the British Electricity Authority and the North of Scotland Hydro-Electric Board generated 7,988 million kWh, 12·2 per cent more than in the corresponding month last year (see Table 1). The latter figure compares with an average rate of increase of 11·3 per cent for the whole of 1954. Plant installed at 31st January amounted to 20,606 MW against 20,567 MW at the end of December.

The Area Boards' sales in January are given in Table 2. The national figures show an increase over January, 1954, of 11·7 per cent, but when corrected for weather conditions which were colder than a year earlier and the number of effective working days (28·06 against 28·14) the increase is 11·9 per cent.

Consumers' Service

The South Eastern Electricity Consultative Council is asking the Board to investigate its night service arrangements and the charges made for replacing the Board's fuses. It was reported at a recent meeting of the Council that a newsagent had complained that when he telephoned at 2 a.m. he was informed that there was no night service after 11 p.m. but that a man would be called out to replace the fuse for a charge of £1.

Definition of Assessable Rooms

The Yorkshire Electricity Board's standard domestic tariff, which has been in operation for two years, was reviewed recently by the Consultative Council. It was stated that the main difficulties related to the inclusion of sculleries, cellar-heads and unwired rooms as assessable rooms. As regards sculleries, the Council came to the conclusion that any attempt to deal with the matter by altering the definition of kitchens and sculleries as now applied by the Board would only lead to further anomalies. It was agreed that the present method of assessment of cellar-heads should be retained as there must normally be in any house some space or room which should be considered as a kitchen.

The Council felt, however, that the position of unwired rooms under the tariff merited further consideration. Consumers, in many cases, could not understand why such rooms should be taken into account. The reason given by the Board, that at some future time the rooms might be wired without the Board's being notified, implied a lack of good faith in consumers, although at the inception of the tariff they were trusted to inform the Board of the number of rooms in their premises.

The Council also agreed that, in view of the reduction in load factor, the Board should be invited to extend the promotional element in all tariffs to improve the load factor. At the same meeting the Council examined the Board's proposed standard charges for public lighting, but deferred approval pending the receipt of further information.

It was decided to ask the Board to examine the question of keeping service centres open on Saturday mornings for the payment of accounts.

Irish Wind Power Tests

A German engineering firm has completed a 12 kW propeller-type wind generator for the Electricity Supply Board which, after tests, will be shipped to Ireland and erected at Verschoyle Hill near Dublin. It is hoped that the generator will be working in about eight months' time. Experiments in the generation of electricity by wind power have been carried out during the past five years by E.S.B. engineers, who have recorded wind velocities on mountain tops along the western seaboard of Ireland from Kerry to Donegal.

After the tests at Verschoyle Hill, approval pending further information.

N.S.W. Power Supplies

The first power from the Snowy Mountains Scheme will be distributed by the New South Wales Electricity Commission this year. The chairman of the Commission, Mr. H. G. Conde, announcing this, said that new hydro-electric power stations were also being developed in conjunction with the Hume and Warragamba dams and new sources of power were being investigated. However, for the foreseeable future New South Wales would be basically dependent for its power on thermal stations burning coal.

Mr. Conde said that the Commission had added 133 MW to the N.S.W. interconnected system during 1954; it expected to add a further 100 MW this year and twice as much in 1956. The new power units brought into production in 1954 were 50 MW at Pyrmont station, the first 30 MW at the new Tallawarra station on Lake Illawarra, 25 MW at Balmain, 16 MW at Port Kembla and 12 MW at Liverpool. The increase was necessary because the demand for power in N.S.W. was rising at the rate of 10 per cent a year. Since the Commission was formed 4½ years ago it had doubled the State's power output.

TABLE 1.—ELECTRICITY GENERATED AND PLANT INSTALLED*

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total†		
British Electricity Authority ...	4,242	111	27·4	7,754	48	7,813	7,358	19,972
N. of Scotland H.E.B.	28	1	1·6	41	127	175	173	634
Total for January, 1955	4,270	112	29·0	7,795	175	7,988	7,531	20,606
Corres. total for January, 1954 ...	3,838	106	18·1	6,945	161	7,122	6,713	19,169
Increase or decrease, per cent ...	+11·3	+5·7	+60·2	+12·2	+8·7	+12·2	+12·2	+7·5

* Comprising all generating stations controlled by the British Electricity Authority and the North of Scotland Hydro-Electric Board.
† Including 13 million kWh generated by oil engines and 5 million kWh by waste heat plants in January, 1955.

TABLE 2.—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for January (million kWh)			Twelve Months Totals Ended 31st January (million kWh)		
	1954	1955	Inc. or Dec. %	1954	1955	Inc. or Dec. %
London	663·9	733·0	+10·4	5,269·4	6,135·3	+ 9·0
South Eastern	389·1	424·9	+ 9·2	3,343·4	3,680·1	+10·1
Southern	442·7	501·2	+13·2	3,925·5	4,394·5	+11·9
South Western	211·7	248·7	+17·5	1,909·1	2,264·2	+18·6
Eastern	613·0	682·6	+11·4	5,425·1	6,012·4	+10·8
East Midlands*	501·8	561·4	+11·9	4,649·3	5,146·1	+10·7
Midlands*	681·8	753·4	+10·5	6,196·6	6,898·8	+11·3
South Wales*	352·2	381·8	+ 8·4	3,517·3	3,980·4	+13·2
Merseyside and North Wales*	367·4	420·4	+14·4	3,478·9	3,968·1	+14·1
Yorkshire*	631·9	708·2	+12·1	6,057·8	6,708·3	+10·7
North Eastern*	360·8	400·3	+10·9	3,634·8	3,967·8	+ 9·2
North Western*	711·8	761·9	+ 7·0	6,773·7	7,446·9	+ 9·9
South East Scotland	138·7	158·8	+14·5	1,302·5	1,471·3	+13·0
South West Scotland*	328·8	363·8	+10·6	3,125·0	3,453·1	+10·5
Total all Area Boards	6,395·6	7,100·4	+11·0	58,968·4	65,527·3	+11·1
Direct Supplies by Central Authority	93·5	146·6	+56·8	979·7	1,335·2	+36·3
Grand Total	6,489·1	7,247·0	+11·7	59,948·1	66,862·5	+11·5
Mainly Industrial Areas* ...	3,936·5	4,351·2	+10·5	37,433·4	41,569·5	+11·0
Mainly Non-Industrial Areas ...	2,459·1	2,749·2	+11·8	21,535·0	23,957·8	+11·3

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

Domestic Electrical Equipment

Vacuum Cleaner

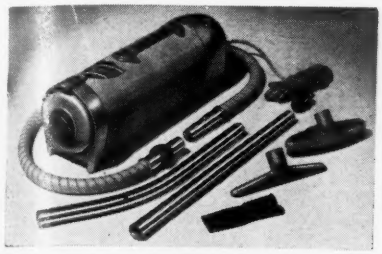
TWO basic types of vacuum cleaners are available, the cylinder model fitted with internal dust bag and the upright with external bag. In general the cylinder cleaner has greater suction power than its upright counterpart but to compensate for this the latter is usually fitted with a motor-driven brush. Use of either model is, however, largely a matter of personal choice.

The consumption of electricity is not heavy as the motor fitted is seldom greater than ¼ h.p.; exceptions are the " extra suction " models which are fitted with ½ h.p. motors.

Universal motors are practically standard and many are now " suppressed " for radio and television interference. As a means of cleaning upholstery, stairs, interiors of cars, etc., the hand-held cleaners are very useful.

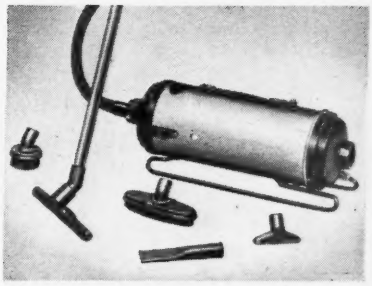
The accessories, which include the extension tubes, brushes, nozzles, crevice tools, etc., are supplied with the cleaner, but such items as paint sprayers, de-mothers, swivel nozzles and special brushes may be obtained as extras.

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish
BRITISH VACUUM CLEANER & ENGINEERING CO., LTD., Goblin Works, Leatherhead, Surrey.	" Regal " G.38	Upright	300 W	Dust-finder headlight, beater brush, height adjuster	Full set brushes and nozzles	Lustre bronze, rust bag
	" Ace " G.51	Cylinder	500 W	Agitator nozzle, foot switch	Full set brushes and nozzles	Two-tone grey velvet body, chromium metal parts
	" Triumph " G.52	Cylinder	300 W	Agitator nozzle, swivelled coupling hose	Full set brushes and nozzles	Grey velvet body, chromium metal parts
	" Clean Sweep " G.53	Cylinder	300 W	Agitator nozzle	Full set brushes and nozzles	Crackle grey and brown
BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2.	" Duco Junior " EC34/92	Cylinder	230 W	—	Complete	Rexine body, cast aluminium end caps
	" Duco Super Silent " EC34/91	Cylinder	230 W	Swivel hose end	Complete	Rexine body, chromium plated end caps
	" Blue Riband " EC34/95	Cylinder	230 W	Swivel hose end, recessed switch	Complete	Rexine body, matching grey metal work and accessories
	" Duco " Hand Standard EC34/99	Hand	150 W	All-rubber nozzle incorporating brush	—	Maroon body and bag
	" Duco " Hand De-Luxe EC34/100	Hand	150 W	Detachable accessories	—	Maroon body and bag, chromium fittings
	" Duco Major " EC34/102	Upright	275 W	Motor driven brush and carpet pile adjustment	Full set	Silver and black
BYLOCK ELECTRIC, LTD., South Street, Enfield, Middlesex.	" Minivac "	Cylinder, hand	160 W	—	Carpet nozzle, dusting brush, extension wand	"Dimenso" body, plated and sprayed accessories
	" Centurion "	Cylinder	400 W	—	Full set brushes and nozzles	Oyster green hammered metal, chromium end caps
	" Classic "	Cylinder	250 W	—	Full set brushes and nozzles	Oyster green sprayed
R. CADISCH & SONS, Red Lion Square, London, W.C.1.	" Cadison "	Cylinder	250 W	Swivel hose connection	Crevice tool, carpet nozzle and upholstery brush	Black diced leatherette, plated end caps
	" Cadison " 1013	Hand	160 W	Hard rubber nozzle, rubber covered handle grip	—	Black crackle
	" Cadison " 1012	Hand	160 W	Removable metal nozzle, rubber covered handle grip	Extension tube, brush and crevice tool	Black crackle
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley.	" Junior Invincible "	Cylindrical	220 W	—	Chromium tubes and wooden bristled brushes	Rexine body and chromium fittings
	" Popular Invincible "	Upright	220 W	—	Chromium tubes and wooden bristled brushes	Stoved enamel, insulated handle
	" Invincible "	Cylindrical	220 W	—	Chromium tubes and wooden bristled brushes	Rexine body and chromium fittings
	" Invincible Vac-Duster "	Hand	150 W	Shockproof	—	Bakelite moulding
CROWN APPLIANCES, LTD., 18, Gipsy Hill, London, S.E.19.	" Lincoln "	Cylinder	350 W	Radio and television interference suppressed	Full set brushes and nozzles	Maroon and plated fittings with grey rexine body



Brown Brothers' "Blue Riband"

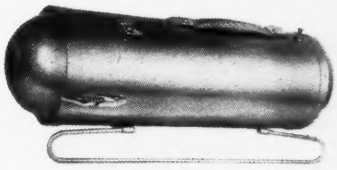
Brown Brothers' "Duco De-Luxe" hand cleaner

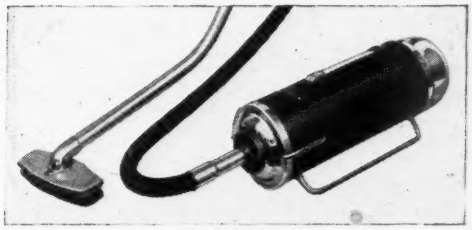


Crown Appliances' "Lincoln"

Price (excl. tax)	Price of Accessories (excl. tax)	Purchase Tax	Purchase Tax on Accessories
£17 10 0	£2 18 6	£6 7 11	£0 10 8
£19 8 6	—	£7 2 0	—
£16 16 0	—	£6 2 10	—
£14 14 0	—	£5 7 6	—
£7 19 6	—	£2 17 6	—
£11 19 0	—	£4 6 3	—
£10 5 1	—	£3 17 8	—
£5 16 0	—	£2 1 10	—
£6 9 4	—	£2 6 8	—
£11 14 0	£3 3 0	£4 4 5	£0 11 10
£6 10 6	—	£2 7 0	—
£13 7 6	—	£4 17 11	—
£8 19 6	—	£3 5 6	—
£8 10 9	—	£3 4 1	—
£5 19 6	—	£2 4 10	—
£6 9 3	—	£2 8 6	—
£10 3 8	£2 10 0	£3 16 4	£0 6 6
£14 16 9	£4 0 0	£5 11 3	£0 14 1
£12 8 0	£2 10 0	£4 13 0	£0 6 6
£7 6 9	—	£2 15 0	—
£12 6 6	—	£4 1 3	—

Bylock "Classic"



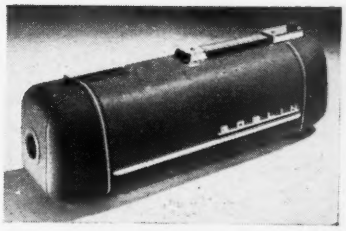


C.W.S. "Dudley Junior"

C.W.S. "Dudley Popular"

Cadisch "Cadison"

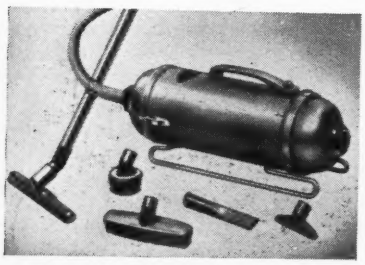
"Goblin" G.51

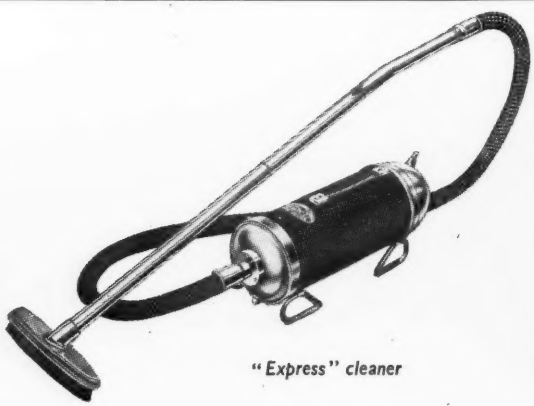


VACUUM CLEANERS . . . . . *continued*

Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish	Price (excl. t
ELECTRIX, LTD., Sterling Works, Dagenham, Essex.	" Swiftclean "	Cylinder	350 W	Radio and television interference suppressed	Full set brushes and nozzles	Fawn and maroon	£10 19 6
	" Halcyon "	Cylinder	350 W	Radio and television interference suppressed	Full set brushes and nozzles	Two shades of fawn	£12 19 6
	" Sterling "	Cylinder	350 W	Radio and television interference suppressed	Full set brushes and nozzles	Fawn and brown	£18 10 0
ELECTROLUX, LTD., 153/5, Regent Street, London, W.1.	" 55 "	Cylinder	400 W	Foot switch, hose coupling and air purification pad	Full set brushes and nozzles, including sprayer	Grey grained " Pegamoid " black plastic end caps	£21 0 0
	" 48 "	Cylinder	300 W	Foot switch and air purification pad	Full set brushes and nozzles	Maroon " Pegamoid " black plastic end caps	£17 0 0
EXPRESS VACUUM CLEANER CO., 96, Bath Street, Birmingham, 4.	" Express "	Cylinder	220 W	Revolving brush for carpets	Full set brushes and nozzles	Black and chromium	£11 0 0
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	" Playfair " U.95638	Hand	160 W	Swivelled carpet nozzle, extension tubes	Full set brushes and nozzles	Stoved enamel and chromium fittings	£8 12 6
FILLERYS (GREAT BRITAIN), LTD., 101, Ladbroke Grove, London, W.11.	" V.P.I."	Upright	215 W (cleaner) 350 W (polisher)	Combined cleaner/ polisher/scrubber	Full set, including de-mothing and carpet shampooing set	Silver grey and maroon	£22 0 0
	" V.X.I."	Upright	215 W	—	Full set brushes and nozzles, including de-mother	Silver grey and maroon	£19 19 0
	" 254 "	Cylinder	350 W	Patent stair climbing sleigh	Full set brushes and nozzles, including de-mother	Silver grey and maroon	£19 13 6
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	" DM310A "	Cylinder	400 W	Double insulated, suppressed for radio and television	Full set brushes and nozzles	Maroon and grey stoved enamel, chromium fittings	£15 15 0
	" DM380 "	Upright	170 W	Double insulated, suppressed for radio and television	Full set brushes and nozzles	Maroon and grey stoved enamel	£15 15 0
GENWIND, New Trading Estate, Lode Lane, Solihull, Birmingham.	Genwind " One Hand "	Hand	100 W	Light Weight	—	Black crackle and chromium	£6 0 0
HOOVER, LTD., Perivale, Greenford, Middlesex.	Standard " 612 "	Upright	330 W	Beats, sweeps and cleans. Revolving brushes	Full set brushes and nozzles	Brown and gold enamelled metal and mouldings	£22 5 0
	Heavy Duty " 912 "	Upright	330 W	As " 612." Specially reinforced for heavy duty	Full set brushes and nozzles	Brown and gold enamelled metal and mouldings	£25 0 0
	Junior " 119 "	Upright	200 W	Beats, sweeps and cleans. Revolving brushes	Full set brushes and nozzles	Brown and gold enamelled metal and mouldings	£16 0 0
	" 417 "	Cylinder	510 W	" Disposall " paper bags, air filter	Full set brushes and nozzles	Maroon and grey enamelled metal and mouldings	£16 16 0

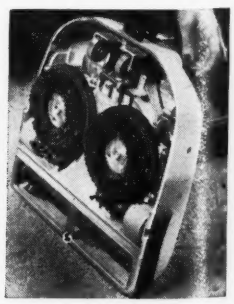
Electrix " Halcyon "





" Express " cleaner

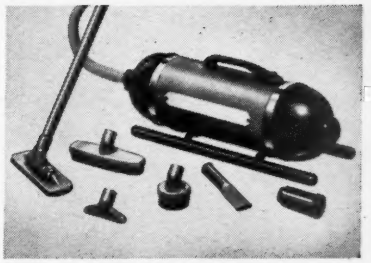
Fillerys Cleaner - Polisher - Scrubber

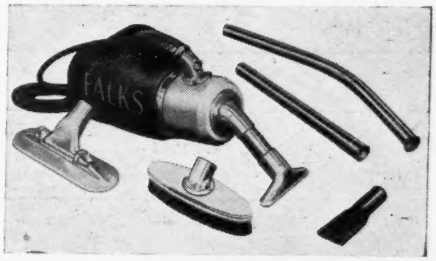


Finish	Price (excl. tax)	Price of Accessories (excl. tax)	Purchase Tax	Purchase Tax on Accessories
and maroon	£10 19 6	—	£3 11 4	—
ades of fawn	£12 19 6	—	£4 4 4	—
and brown	£18 10 0	—	£6 0 3	—
y grained gamoid" stic end caps	£21 0 0	—	£7 13 6	—
aroon gamoid" stic end caps	£17 0 0	—	£6 4 3	—
d chromium	£11 0 0	—	£4 2 6	—
enamel and um fittings	£8 12 6	—	£3 4 9	—
grey and roon	£22 0 0	£4 1 6 (dusting accessories only)	£7 18 10	£0 11 5
grey and roon	£19 19 0	£4 1 6 (dusting accessories only)	£7 4 0	£0 11 5
grey and roon	£19 13 6	—	£6 6 3	—
and grey enamel, m fittings	£15 15 0	—	£5 15 3	—
and grey enamel	£15 15 0	£3 0 0	£5 15 3	£1 1 11 (with cleaner) £0 11 0 (separately)
ckle and mium	£6 0 0	—	£2 5 0	—
nd gold metal and dings	£22 5 0	£4 0 0	£8 6 11	£0 9 9
nd gold metal and lings	£25 0 0	—	£9 7 6	—
nd gold metal and ings	£16 0 0	£2 18 0	£6 0 0	£0 8 11
nd grey metal and ings	£16 16 0	—	£6 6 0	—

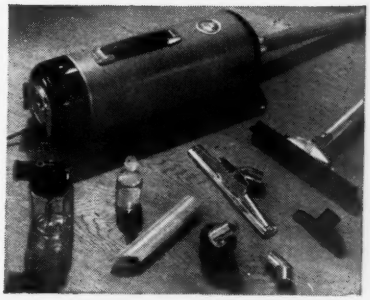
Electrix "Sterling"

Below: Falk Stadelmann "Playfair"





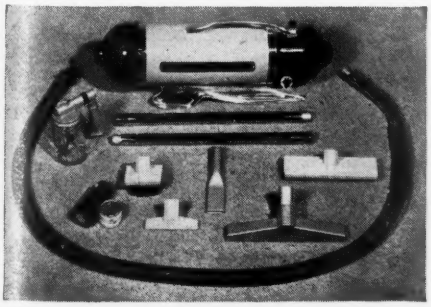
Electrolux "55"



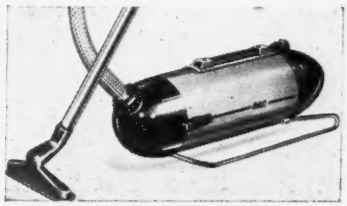
G.E.C. "DM. 380" upright model

Hoover "Dustette"

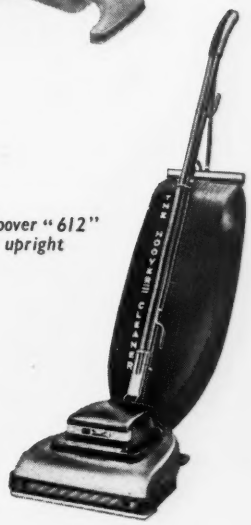
Fillery's "Step-up" 254



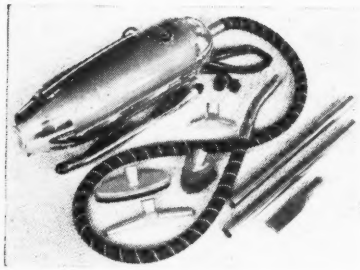
G.E.C. "DM. 310A" cylinder



Hoover "612" upright

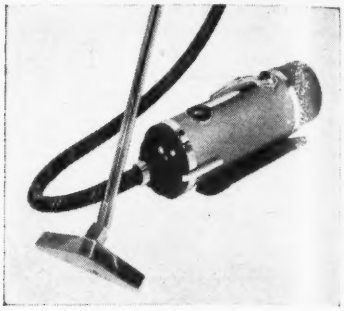


VACUUM CLEANERS . . . . . *continued*



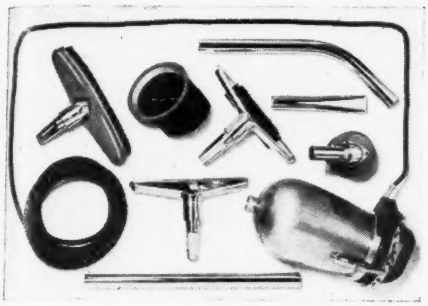
Phœnix "Jet-Power"

Siroma hand cleaner



Vactric "W.202"

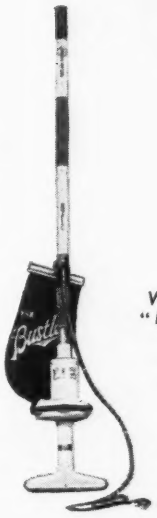
Manufacturer	Name or Model	Type	Motor	Special Features	Accessories	Finish
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Fletton, Peterborough.	"411"	Upright	190 W	Dust sleeve, foot operated switch	Full set brushes and nozzles	Grey stoved enamel, maroon bag
NASH ELECTRICAL CO., LTD., 82, Snow Hill, Birmingham, 4.	"Quikavac"	Upright	130 W	Lightness	Full set brushes and nozzles	Green, black and blue enamelled
PHŒNIX SALES, LTD., Winton House, St. Andrew Street, London, E.C.4.	"Popular"	Cylinder	280 W	—	Full set brushes and nozzles	Leatherette body, nickel plated end caps
	"Gloria"	Cylinder	250 W	—	Full set brushes and nozzles	Leatherette body, nickel plated end caps
	"Major"	Cylinder	230 W	—	Full set brushes and nozzles	Brown leatherette body, chromium end caps
	"Clipper"	Cylinder	230 W	—	Full set brushes and nozzles	Coloured leatherette, Bakelite insets, chromium end caps
	"Jet-Power"	Cylinder	480 W	Extra power and suction	Full set brushes and nozzles	Chromium metal parts, blue body
	"Power-Flo"	Cylinder (box)	480 W	Extra power and suction	Full set brushes and nozzles	Lizard skin with maroon Bakelite end caps
SIROMA ENGINEERING CO., LTD., North Acton Road, Harlesden, N.W.10.	"Siroma" HC1012/B	Hand	160 W	—	Extension tube, brush, crevice tool and nozzle	Biscuit and brown
	"Siroma" HC1013/B	Hand	160 W	—	None	Biscuit and brown
ALBERT TAYLOR (MANCHESTER), LTD., Quay Street, Manchester, 3.	Compet "Major"	Upright	230 W	—	Full set brushes and nozzles	Grey anodized, black bag
	Compet "Senior"	Cylinder	230 W	Wheels, swivel hose attachment	Full set brushes and nozzles	Leatherette body, chromium metal parts
	Compet "Junior"	Cylinder	230 W	Metal slides, swivel hose attachment	Full set brushes and nozzles	Leatherette body, chromium metal parts
	Compet "Handy"	Hand	160 W	Warm air outlet, balanced weight	Three accessories	Black crackle, chromium metal parts
TELLUS SUPER VACUUM CLEANER, LTD., 39, Sheen Lane, Mortlake, S.W.14.	"R.40"	Canister	200 W	Hygienic metal dirt container	Full set brushes and nozzles	Polished aluminium
	"S.55"	Canister	375 W	Hygienic metal dirt container	Full set brushes and nozzles	Polished aluminium
VACTRIC, LTD., 196, Sloane Street, London, S.W.1.	"W.202"	Cylinder	400 W	Special swivelled nozzle design	Full set brushes and nozzles, including sprayer	Durable "Dimenso" and chromium metal parts
	"R.53"	Upright	210 W	Vibro action, handle release pedal	Full set brushes and nozzles	Durable "Dimenso"
VACUUMS, LTD., Aldridge Road, Birmingham, 22B.	"Bustler"	Upright and hand	130 W	Lightness	Full set brushes and nozzles	Cream enamel and polished aluminium
WATER SOFTENER & VACUUM CLEANER SERVICE, LTD., 248, Romford Road, Forest Gate, London, E.7.	"Jifextra"	Hand	180 W	Dual purpose floor cleaner and "vacette"	Full set brushes and nozzles	Chromium and polished aluminium, crackle stoved enamel
WHOLESALE FITTINGS CO., LTD., 46-52, Commercial Street, E.1.	"Alto"	Hand	160 W	Warm air outlet, rubber handle grip	Brushes and nozzles	Maroon body, chromium fittings



"Jifextra" dual-purpose cleaner

Price (excl. tax)	Price of Accessories (excl. tax)	Purchase Tax	Purchase Tax on Accessories
£12 19 6	£3 0 0	£4 14 11	£1 1 11 (with cleaner) £0 9 0 (separately)
£12 0 0	—	£4 4 10	—
£10 10 0	—	£2 17 3	—
£11 6 6	—	£3 1 9	—
£12 9 6	—	£3 8 0	—
£13 13 0	—	£3 14 5	—
£16 16 0	—	£4 11 7	—
£15 15 0	—	£4 5 11	—
£6 9 3	—	£2 7 3	—
£5 19 6	—	£2 3 8	—
£11 10 0	£2 17 6	£4 4 6	£1 1 0
£11 15 0	—	£4 6 3	—
£8 5 6	—	£3 0 9	—
£6 7 6	—	£2 6 9	—
£22 10 0	—	£8 10 0	—
£26 5 0	—	£9 18 4	—
£19 15 0	—	£6 6 9	—
£15 15 0	£3 15 0	£5 1 1	£0 12 1
£13 5 9	£2 11 0	£4 15 11	£0 6 4
£10 18 2	—	£4 1 10	—
£6 13 4	—	£2 8 9	—

Nash "Quikavac"



Vacuums "Bustler"

Hotpoint "411"

Vactric "R.53"

Tellus "S.55"

Financial Section

STOCKS and SHARES

THE accompanying price lists give evidence this week of the remarkably severe reverse suffered by Stock Exchange markets in the middle of the month. Falls of one to two points in the British Electricity stocks give the key to the most generally accepted reason for the relapse of industrial shares. Since the failure of the recent half per cent increase in Bank Rate to produce noticeable results of the kind required, the gilt-edged market has been heavy, with forebodings about sterner measures. Uncertainty kept buyers out of almost all markets, and a wave of profit-taking consequently met, at one time, with little opposition. At the opening of business this week, a condition of acute flatness prevailed until, on Monday afternoon, a violent upward reaction wiped out some of the previous losses and left everybody asking: "What next?"

Extent of the Fall

In these unsettled market conditions one day's prices may be very different from those of twenty-four hours later, so that it would be invidious to single out for comment the changes recorded in individual share quotations. It may, however, be noted as a generalization that the top-grade issues of the industrial market felt especially the drag exercised by the fall in gilt-edged prices, and by the resultant rise in the yield from Government securities. When War Loan can be bought to give well over 4 per cent on the money invested in it, the tendency is to look askance at ordinary shares showing yields no greater or even less than that. Elsewhere, the extent of the decline in some of the recent favourites in the fields of electronics and household appliances suggested the existence of shaky speculative positions.

Free of Stamp

Investors usually welcome new issues as an opportunity for acquiring investments free of the onerous 2 per cent transfer stamp duty, which may often be regarded these days as costing the buyer the best part of a year's net income. This month's issues by Electric & Musical Industries and by G.E.C. (in addition to the ordinary share offer) make available substantial amounts of fixed-interest stock in stamp-free form. The E.M.I. issues consist of £2 million 4½ per cent loan stock 1970/75 at par, and 3 million 5½ per cent £1 second preference shares at 20s 6d. Application lists for the company's stockholders closed on Tuesday of this week. The G.E.C.'s offer, also to stockholders, is of £6 million 4 per cent loan stock 1975/80 at 97½. In this case, applications had to be in by yesterday (Thursday). Dealings on these occasions usually begin within a day or two of the closing dates.

Good company news has still been able to make its effect felt on the shares concerned. A case in point is the firmness of Mather & Platt £1 shares since the announcement of the increase in the dividend and the earnings for the

Week's Price Changes

Company or Board	Nom. Value	Middle price 21st Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	90	−1½	3	3	3 6 8	97	88⅞
Brit. Elec. 1974/77	100	88½	−1	3	3	3 7 9	96½	87½
Brit. Elec 1976/79	100	94½	−2	3½	3½	3 14 0	101½	93⅜
Brit. Elec. 1974/79	100	102¼x.d.	−2	4½	4½	4 3 0	111½	103⅛
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		6†	6†	5 14 3†	24/6	18/7
East African Power	£1	21/6		7	7	6 8 9	23/4	19/6
Nigerian Elec.	£1	26/6	+1/-	10	10	7 11 0	25/-	23/6
Palestine Elec. "A"	£1	22/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	18/6		6	10	10 16 3	20/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/-	−3d	25	12½*	4 16 3	14/3	8/1
Aerialite	1/-	6/-	−3d	88½	88½	7 7 3*	14/6	10/9
Allen, W. H.	£1	79/6		15	20	5 0 8	78/6	50/-
Aron Elec. Ord.	£1	61/3		20	15	4 17 7	60/-	43/-
Assoc. Elec. Ord.	£1	70/-	−2/6	20	11¼*	—	62/6	41/6
Automatic Tel. & El.	£1	76/3	−2/6	15	15	—	73/-	57/3
Babcock & Wilcox	£1	78/6	+3d	18	12*	3 1 0	76/3	47/3
Baldwin, H. J.	2/-	5/-		20	20	8 0 0	5/6	3/9
Bakelite	10/-	30/6	−9d	12½	12½	4 2 0	32/-	23/6
British Aluminium	£1	40/-	−3/-	12	10	5 0 0	41/-	33/9
B.I. Callender's	£1	48/9	−4/6	10	10	4 2 0	52/-	37/9
B I. Callender's 6% Pref. ...	£1	24/6	−6d	6	6	4 18 0	26/6	24/3
British Thermostat	5/-	26/3		35	27½*	—	28/-	12/-
British Vac. Cleaner	5/-	16/9		15	25	7 9 3	14/6	11/6
Brook Motors	10/-	42/-		20	20*	—	45/6	29/3
Brush Ord.	5/-	8/3	−1/-	4	6	3 12 9	8/3	3/6
Bulgin, A. F.	1/-	5/-	−3d	30	30	6 0 0	4/3	3/2
Burco	5/-	22/6		35	25*	5 11 0	21/6	12/1
Chloride El. Storage "A" ...	£1	66/3	−1/9	20	12½*	3 15 6	69/6	46/6
Clarke Chapman	£1	72/-	−3/9	17½	20	—	73/-	47/6
Cole, E. K.	5/-	21/9	−9d	25	27½	3 3 3*	20/-	11/6
Cossor, A. C.	5/-	10/3	−6d	10	10	4 17 6	11/-	7/-
Crabtree	10/-	33/9		17½	20	5 18 6	32/-	23/9
Crompton Parkinson Ord. ...	5/-	18/3	−1/-	20	20	—	17/9	11/6
De La Rue	5/-	21/9	−1/9	Nil	20	4 12 0	24/-	12/3
Decca	4/-	57/6	−3/9	35	56½*	3 18 3	56/6	32/-
Desoutter	5/-	26/3		18	20	3 16 4	26/6	16/1
Dewhurst	2/-	8/-		19	24	6 0 0	7/6	5/1
Dictograph Tel.	2/-	7/3		20	20	5 10 4	8/-	5/2
Dubilier Condenser	1/-	4/9	−3d	25	25	—	5/3	3/3
E.M.I.	10/-	33/-	−2/-	8	10	3 0 6	27/9	11/3
Electrical Components	5/-	17/3		20	20	5 16 0	16/3	10/9
Elec. Construction	£1	37/-		15	15	4 1 0*	35/-	26/6
Enfield Cable Ord.	£1	22/6	−1/3	5	Nil	Nil	26/3	16/6
English Electric	£1	65/-	−3/9	10	12½	3 17 0	59/-	38/-
English Electric 3¾% Pref. ...	£1	15/6		3¾	3¾	4 16 9	16/9	15/3
Ericsson Tel.	5/-	35/-	−1/-	22†	25†	1 15 9*†	33/9	22/9
Ever Ready	5/-	24/6	+6d	35	40	—	26/3	17/9
Falk Stadelmann	£1	50/-		15	15	6 0 0	49/-	36/6
G.E.C. Ord.	£1	55/-x.r.	−2/6	11½	12½	4 11 0	60/-	37/6
G.E C. 6½% Pref	£1	26/3		6½	6½	4 19 0	28/9	26/6
General Cables	5/-	16/9		30	30	8 19 0	18/-	16/3
Greenwood & Batley	£1	55/-		17½	17½	6 7 3	55/-	40/3
Hackbridge Cable	5/-	14/9	−9d	20	20	6 15 6	15/9	11/3
Hackbridge & Hewittic	5/-	27/-	−6d	20	25	4 12 6	25/-	16/10
Hall Tel. Acc.	10/-	12/-		10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/-	−6d	12½	12½	5 0 0	5/6	4/-
Henley's	10/-	19/9	−6d	10½	10½	5 6 3	22/-	15/6
Holophane...	5/-	19/6		20	25	6 8 3	18/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

past year. The final payment of 6 per cent, plus 5 per cent bonus, applies to the capital increased by a two-for-three scrip issue since the payment of the 4 per cent interim for 1954 and of the previous year's total of 15 per cent. On the basis of the present capital of £3·4 million, the latest total is equivalent to 13·4 per cent, and to an improvement of 4·4 per cent. The yield on the shares now works out at a little over 4½ per cent.

in Electrical Investments

Company or Board	Nom. Value	Middle price 21st Feb.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	47/6	−2/3	25	45	4 19 0	51/-	26/3
I.C.I.	£1	41/9	−2/-	13	15	3 11 9*	43/6	26/6
Intl. Combustion	5/-	27/6	−2/6	20	25	4 11 0	30/-	14/6
Johnson & Phillips	£1	51/-	−1/-	15	15	5 17 9	52/6	45/6
Lancashire Dynamo	£1	60/-		12½	14	4 13 4	59/6	43/-
Laurence, Scott	5/-	16/3		15	20	3 1 6*	4/9	7/-
Lister, R. A.	£1	36/3	−1/3	12	9·3°	5 2 6	33/-	22/6
London Elec. Wire	£1	57/6		15	10*	3 9 6	54/-	38/-
Lucas, J.	£1	47/6	−2/6	10·8	7½°	3 3 3	49/-	25/3
Marryat & Scott	2/-	9/9		22½	25	5 2 6	9/6	5/11
Mather & Platt	£1	58/9	+1/3	15	13·4°	4 11 0	53/-	32/-
Metal Industries	£1	34/-x.d.	−1/-	12	9	5 6 0	42/3	29/6
Midland Elec. Mfg.	£1	45/-		15	15	—	43/9	31/6
Morphy-Richards	4/-	27/6	−2/-	40	35°	5 1 9	27/6	11/4
Murex	£1	52/-	−1/-	15	15	5 15 6	57/-	49/-
Newman Ind.	2/-	3/3		10	10	6 3 0	2/6	2/-
Oldham & Son	1/-	3/3		17½	17½	5 7 9	3/4	2/5
Parnall (Yate)	5/-	10/9	−1/6	6	8	3 14 6	11/-	4/3
Parsons, C. A.	£1	67/6		12½°	7½°	2 4 6	60/-	38/1
Plessey	10/-	68/-	−7/-	30	20°	2 18 9	64/-	37/10
Pye Deferred	5/-	36/9	−3/-	20	20°	2 14 6	37/-	15/7
Revo	10/-	14/-		27½	9°	6 8 6	20/3	14/-
Reyrolle	£1	5	−5/-	12½	13¾	2 15 0	92/6	66/-
Rheostatic	4/-	16/3	−3d	19	20	4 18 6	15/9	11/-
Richardsons Westgarth	5/-	13/9	−9d	15	15°	5 9 0	12/3	6/6
Scottish Cables	4/-	21/3	−6d	20	27½	5 3 6	21/9	12/1
Smith (England), S.	4/-	17/6	−1/6	15	17½°	4 0 0	17/6	7/8
Southern Areas	£1	30/6	−2/-	6	7½	4 18 3	32/6	17/6
Strand Elec	5/-	9/9		17½	17½	8 19 6	10/3	8/3
Sturtevant	5/-	24/9		18·1††	18·9°†	—	22/9	14/6
Sun. Elec	£1	33/9		15	15	8 17 9	33/9	27/6
Switchgear & Cowans	5/-	15/3	+3d	22½	10	3 6 8	13/7	9/9
Taylor Tunnicliff	5/-	13/3		25	12½°	4 14 3	12/4	10/7
T.C.C.	10/-	43/9		20	30°	—	41/3	21/3
T.C. & M.	£1	38/-	−2/-	10	8½°	4 9 6	37/6	30/3
Telephone Mfg.	5/-	10/-	−3d	10	10	4 17 6	9/6	7/6
Thorn Elec.	5/-	35/-		12½	20	2 17 3	30/6	13/3
Thornycroft	£1	39/-	−2/3	15	15	—	39/6	26/6
Tube Investments	£1	80/-	−2/6	15	17½	4 7 6	81/3	60/3
Vactric	5/-	35/-	−1/3	Nil	10	1 8 9	24/6	7/6
Veritys	5/-	8/3	−6d	10	12½	7 11 6	10/6	5/-
Walsall Conduits	4/-	52/6		70	70	5 6 8	52/6	44/-
Ward & Goldstone	5/-	42/9		45	50	—	43/6	21/-
Watford	2/-	7/-		25	22½°	—	7/3	4/7
Westinghouse Brake	£1	97/6	−2/6	16	18	3 13 9	86/3	60/9
West, Allen	5/-	15/-	−3d	15	17½	—	19/6	12/7
Wolf Electric	5/-	18/9	+3d	15	17½	4 13 3	17/6	11/-
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A Ord.	100	82	−1	6	6	7 6 3	89½	80
Ord.	100	52½		3½	3½	7 2 10	55½	52
Anglo-Portuguese	£1	23/-	−6d	8	8	6 19 3	25/9	21/-
Brit. Elec. Traction:								
Def Ord.	5/-	21/6	−2/-	35	50	—	24/-	13/-
Cable & Wireless:								
Ord.	£1	42/-x.d.	−1/3	9	10*	4 15 3	42/9	26/2
4% Loan	100	98½	−1	4	4	4 1 3	98½	95½
Calcutta Trams	£1	20/6x.d.		2½†	6†	5 17 0†	24/6	17/1
Cape Elec. Trams	£1	17/-		5½	7	8 4 9	17/6	12/4
Marconi Marine	£1	34/6	−6d	10	10	5 16 0	35/-	27/6
Oriental Tel. Ord.	£1	99/-		16	16	—	101/3	82/6
Telephone Props.	£1	85/-	−2/6	—	—	—	92/6	74/6
Telephone Rentals	5/-	11/-	−3d	10	10	4 11 0	11/-	9/-

English Electric Earnings

The preliminary statement of English Electric's results confirms the total ordinary distribution for 1954 at 12½ per cent, as indicated earlier at the time of the company's offer for the Vulcan Foundry shareholding. Group profits, before tax, of £5·4 million are shown to have risen by about 12 per cent. The tax charge at a little over £3 million is lower than before, thanks presumably to relief from the excess profits levy, so that after these and all other changes, the net surplus of £2·1 million available for dividends and reserves shows a proportionately larger improvement. The ordinary dividend involves the distribution of some £730,000 net, and is thus again well covered.

G.E.C. New Shares

The General Electric Company's new £1 ordinary shares, of which a little short of two million are being offered to existing stockholders, opened at a premium of 10s 3d on the issue price of 48s and subsequently fell to 6s 9d premium in sympathy with the general trend. They are at present nil paid, with the full amount of 48s payable on 4th March, the last day for acceptances. Allotments may be renounced up to 15th April; until then the shares will be transferable free of stamp duty. They will qualify for the final dividend of 8 per cent which the board expects to recommend for the year ending next March, and offer a prospective yield of about 4½ per cent on the total 12½ per cent which such a distribution would make for the year.

"Rights" Issues

On the subject of "rights" issues of shares, mention may be made of the fact that the number of people who fail to take advantage of profitable opportunities is sometimes remarkably large. It is reported that the Decca Company, in making its recent issue of shares at 15s, went to great length and trouble, by telegram and telephone, to locate non-acceptors of some thousands of shares, each one of which was commanding a premium of no less than 44s, or thereabouts.

"Excess" Shares

With "rights" issues of ordinary shares recently completed by Decca, in progress from G.E.C., and perhaps in prospect from other of the big electrical engineering groups, attention may be recalled usefully to the invitation usually given on these occasions to subscribe for "excess" shares. These are the surplus shares for which, for one reason or another, shareholders neglect to exercise their subscription rights. If the new shares develop anything at all substantial in the way of a premium, the number available must be expected to be very small. Many people think it worth while, however, to put in at least a modest application, on the view that any allotment of shares means, in effect, a gift of the premium on them.

REPORTS and DIVIDENDS

The English Electric Co., Ltd.—The preliminary statement for 1954 shows a group profit of £5,371,281, as compared with £4,779,920 for the preceding year. Taxation absorbs £3,041,462, and after transferring to capital reserve taxation relief on investment allowance on capital expenditure of £225,600, the net balance is £2,104,219, of which £2,098,609 is attributable to the English Electric Co. It is proposed to pay a final dividend of 8½ per cent, making 12½ per cent for the year on £10,616,193 ordinary stock. For 1953 the total distribution was 11⅔ per cent, of which the interim dividend of 5 per cent was paid on £5,308,097 stock.

Marconi's Wireless Telegraph Co., Ltd.—A group profit of £950,255 is shown in the preliminary statement for 1954, as compared with £862,283 for 1953. Taxation requires £514,282 and taxation relief on investment allowance on capital expenditure amounting to £15,600 is transferred to capital reserve. After placing £275,000 to general reserve, it is proposed to pay an ordinary dividend for the year of 10 per cent (against 7 per cent).

The Marconi International Marine Communication Co., Ltd., in a preliminary statement, shows that after meeting all charges, other than taxation and transfer to capital reserve, the group profit for 1954 is £334,065, as compared with £290,265 for 1953. Taxation absorbs £130,448 and taxation relief on investment allowance on capital expenditure of £62,500 is placed to capital reserve, leaving a net balance of £141,117 (against £90,563). General reserve receives £50,000. It is proposed to pay a final dividend of 6 per cent, making 10 per cent for the year. This is at the same rate as for 1953, but the final dividend is paid on larger capital.

D. Napier & Son, Ltd.—The preliminary statement shows a profit for 1954 of £330,431, as compared with £265,012 for the previous year. From this is deducted taxation of £141,000 and taxation relief on investment allowance on capital expenditure of £57,000 transferred to capital reserve. It is proposed to pay a dividend for the year of 10 per cent (against 7½ per cent).

Siemens Brothers & Co., Ltd., have announced an interim ordinary dividend of 10 per cent. In declaring the dividend, the board states that it has no intention of recommending any further dividend in respect of the year.

Mather & Platt, Ltd., in a preliminary statement report a net profit for 1954 of £799,873, as compared with £558,606 for 1953. This is after providing £1,020,984 for taxation. It is proposed to pay a final ordinary dividend of 6 per cent and a bonus of 5 per cent, making 15 per cent for the year. This is at the same rate as for the previous year, but the final dividend is paid on capital increased by a 66⅔ per cent scrip issue.

International Combustion (Holdings), Ltd., reports that after providing £995,546 for taxation the group net profit for the year ended 30th September last is £629,378, as compared with £528,222 for 1952-53, of which £629,004 is attributable to the holding company. It is proposed to pay a final ordinary dividend of 15 per cent (same), making 25 per cent for the year (against 20 per cent).

Crabtree Electrical Industries, Ltd., has announced an interim ordinary dividend of 7½ per cent (unchanged).

Solus Teoranta (the Irish lamp-making concern) has declared an interim dividend of 5 per cent (unchanged).

Desoutter Brothers (Holdings), Ltd.—The accounts for 1954 show that after providing £238,227 for taxation the group profits are £228,321, as compared with £127,938 for 1953. General reserve receives £100,000, and it is proposed to pay a final dividend of 15 per cent (against 12½ per cent), making 25 per cent for the year (20 per cent). The balance carried forward is £127,495 (against £69,000 brought in).

The Calcutta Tramways Co., Ltd., is paying an interim dividend of 3 per cent, tax free (against 2½ per cent).

New Companies

Luxor Electrical Co., Ltd.—Registered 3rd February. Capital £1,000. To install, develop and operate radio and television equipment, etc. Directors: T. Evans and G. Harry. Regd. office: 24, Briton Ferry Road, Neath, Glam.

G. D. Underwood, Ltd.—Registered 4th February. Capital £5,000. Makers of and dealers in electric lamps and accessories of all kinds, etc. Directors: G. D. Underwood (secretary) and J. M. Underwood. Regd. office: 1055, High Road, Whetstone, N.20.

Electro-Mechanical Supplies (Leicester), Ltd.—Registered 3rd February. Capital £5,000. Dealers in and manufacturers and fabricators of electrical goods of all kinds, etc. Directors: G. Lockwood and J. M. Hollander (directors of Electro-Mechanical Supplies, Ltd., etc.). Regd. office: 28-32, The Butts, Coventry.

Remoco Electrical Appliances, Ltd.—Registered 10th February. Capital £100. Manufacturers and distributors of, agents for and wholesale and retail dealers in electrical goods of all kinds, vacuum cleaners, radio and television, etc. Directors: J. J. Riordan and J. L. Concannon. Regd. office: 85, Camberwell Road, London, S.E.5.

P. J. Wheeler, Ltd.—Registered 2nd February. Capital £500. Electrical engineers and general electrical installation contractors, radio engineers, etc. Directors: P. J. Wheeler (managing) and P. J. Williams. Regd. office: 28, Chislehurst Road, Orpington, Kent.

Morgan & Co. (Cardiff), Ltd.—Registered 10th February. Capital £200. Electricians, electrical contractors and engineers, mechanical and radio engineers, etc. Directors: L. W. Morgan and R. J. O'Brien. Regd. office: 15, Dumfries Place, Cardiff.

South London Electrical Equipment Co., Ltd.—Registered 2nd February. Capital £3,500. K. V. Slee is the first director. Regd. office: 81, Lewisham High Street, S.E.13.

Increases of Capital

I.S.T. Insulations, Ltd.—Increased by £99,900, in 9,950 6 per cent cumulative preference shares of £1 and ordinary shares of 1s, beyond the registered capital of £100. The above increase is for the purpose of acquiring not less than 90 per cent of the issued share capital of Insulating Sleevings & Tapes, Ltd. The company was made "public" on 8th December, 1954.

Contactor Switchgear, Ltd.—Increased by £150,000, in 5s shares, beyond the registered capital of £150,000. The company was made "public" on 14th December, 1953, on which date the 150,000 ordinary shares of £1 in the capital were subdivided into shares of 5s each.

Midland Electric Manufacturing Co., Ltd.—Increased by £725,000, in 450,000 ordinary and 275,000 unclassified shares of £1 each, beyond the registered capital of £525,000.

Laurence, Scott & Electromotors, Ltd.—Increased by £600,000, in 5s "A" ordinary shares, beyond the registered capital of £1,100,000.

Woodbridge House Electrical Co., Ltd.—Increased by £900, in £1 shares, beyond the registered capital of £100.

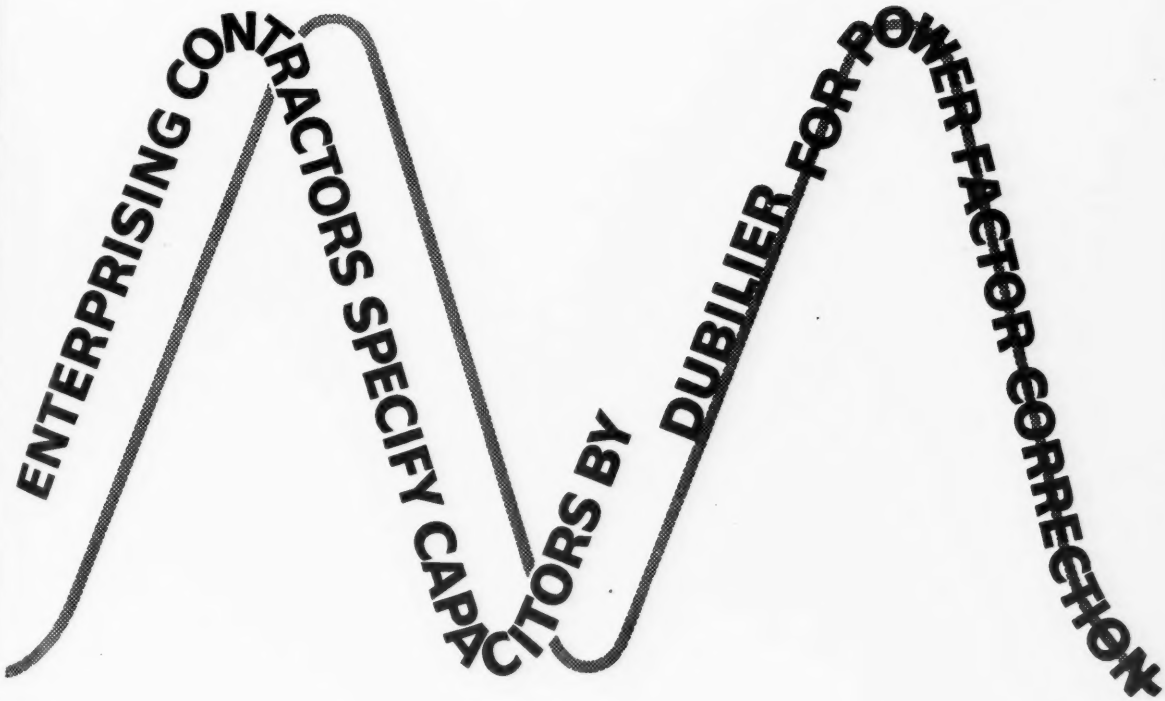
Liquidations

Geo. Andrews & Co., Ltd., electrical engineers.—Liquidator, Mr. W. A. Mountain, Old Post Office Chambers, Skegness, appointed 22nd January with a committee of inspection.

Electrical & Radio Installations (Ealing), Ltd.—First dividend of 5s in the £, payable on and after 1st March at the offices of the liquidator, Mr. J. B. Clifford, 4, Bucklersbury, London, E.C.4.

Bankruptcies

F. R. A. Lock and **V. C. Lock,** trading as Locke Brothers, at Union Street, Stourbridge, Worcs, electrical engineers. Separate application of V. C. Lock.—Order made 13th January granting discharge, subject to consenting to judgment for £50 being entered against him by the Official Receiver and paying £1 10s costs of judgment. (Note: £50 plus £1 10s costs paid to Official Receiver in lieu of entering up judgment.)

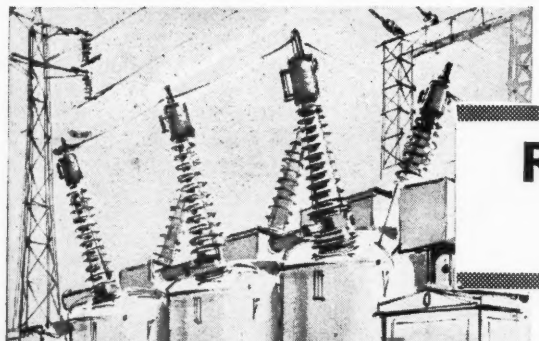


DUBILIER

Dubilier Condenser Company (1925) Ltd., Ducon Works, Victoria Road, North Acton, London, W.3

Phone : ACOrn 2241 (5 lines). Gram : Hivoltcon Wesphone. London Marconi Inter Code

DN 113



Rawlplug fixing devices and tools

For screw or bolt fixing in hard materials, the most satisfactory way is to use Rawlplug Fixing Devices. There's no laborious chipping of big holes, no grouting in, no damage to make good—neater, *stronger* fixings too! For hole-boring there's a complete range of Rawlplug Tools, hand or power, unequalled for speed and cutting efficiency.

AND THE ELECTRICAL INDUSTRY

Saddles and clips, cable racks and hangers, switches, fuseboards—every kind of electrical fitting up to heavy motors—all these are best and most speedily fixed with Rawlplug Fixing Devices.

Write our Technical Dept. about your fixing problem

8478

THE WORLD-WIDE FIXING DEVICES ORGANISATION THE RAWLPLUG COMPANY LIMITED · CROMWELL ROAD · LONDON · S.W.7

CONNAUGHT ROOMS

are Banqueting Rooms

A CONSTANT READER of these announcements has voiced a mild complaint. Why do we keep harping on the buildings when he wants to hear about the food and wine? Does it really matter that the Rooms were built and designed *from the start* for this purpose of banqueting?

He should realise that the matter is of supreme importance if the banquet with all its great tradition is to survive much longer. For the organisation and preparation of a banquet in all its glory can never be a side-line or a part-time job; it calls not only for specialist chefs and all their helpers but specialised services too—services that ensure that not only the top tables but every guest at even the biggest of banquets may have every course freshly cooked to the minute, piping hot and gastronomically beyond compare! There is nothing to compare with the Connaught Rooms anywhere in the world.

Are we wrong and idealistic in seeking such perfection? Perhaps we are, but you won't think so when next you dine at the Connaught Rooms.

In the Entrance Hall, there's another service for the benefit of our customers and their friends—a bureau where you'll find all your travel and entertainment bookings are looked after with smooth efficiency.

TELEPHONE: HOLBORN 7811

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 28th February

BIRMINGHAM.—James Watt Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. "Thermionic Valves of Improved Quality for Government and Industrial Purposes," by E. G. Rowe, P. Welch and W. W. Wright; and "A Study of Some of the Properties of Matter Affecting Valve Reliability," by Dr. E. A. O'Donnell Roberts.

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Utilization Group. "The Dual Purpose Domestic Heat Pump," by G. O. McLean.

LEEDS.—24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "Prescribing for Seeing," by M. L. Berson.

LEICESTER.—E.M.E.B., Charles Street, 6 p.m. I.E.S. Leicester Centre. "Lighting Maintenance Problems," by J. W. Strange.

NEWCASTLE-UPON-TYNE.—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "The Electrification of the Manchester-Sheffield-Wath Lines, Eastern and London Midland Regions, British Railways," by J. A. Broughall and K. J. Cook.

Tuesday, 1st March

CARDIFF.—Angel Hotel, Westgate Street, 7.30 p.m. A.S.E.E. South Wales Branch. Film show.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," by J. W. Bunting.

HAMMERSMITH.—Windsor Castle Hotel, 134, King Street, 7.30 p.m. A.S.E.E. West London Branch. "The Cross Channel Power Link," by E. L. Davey.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. "Iron Losses at High Magnetic Flux Densities in Electrical Sheet Metals," by Prof. F. Brailsford and C. G. Bradshaw; and "An Improved Precision Permeameter," by Dr. C. D. Mee and Dr. R. Street.

At the Royal Society of Arts, John Adam Street, 6.30 p.m. Incorporated Plant Engineers, London Branch. Annual general meeting.

MANCHESTER.—Engineers' Club, Albert Square, 7 p.m. I.E.E. North-Western Centre. "The Nature of Textiles," by Prof. W. E. Morton. (In co-operation with the University of Manchester.)

OLD PORTSMOUTH.—B.E.A. Conference Rooms, High Street, 7.30 p.m. A.S.E.E. Portsmouth Branch. "Television, Past, Present, Future, Colour."

TINGLEY.—I.E.E. North Midland Students' Section. Visit to North Eastern Gas Board Works, at 7 p.m.

Tuesday, 1st March, to Saturday, 26th March

LONDON.—Olympia. Ideal Home Exhibition.

Wednesday, 2nd March

BARNSLEY.—Town Hall, 7 p.m. I.E.E. North Midland Centre. "Electricity in Mines," by C. D. Wilkinson. (Joint meeting with the Sheffield Sub-Centre.)

CHELMSFORD.—I.E.E. London Students' Section, Chelmsford & District. Visit to Crompton's Historical Collections, Works Gates, Writtle Road, at 7.15 p.m.

COVENTRY.—At the G.E.C. Radio Works, 7 p.m. I.E.E. South Midland Students' Section. "Intermediate Frequency Oscillators," by H. A. MacDonald.

EDINBURGH.—12, Rothesay Place, 7 p.m. I.E.S. Edinburgh Centre. "The Evaluation of Lighting," by R. G. Hopkinson.

Chamber of Commerce, Charlotte Square, 7 p.m. Institute of Welding, East of Scotland Branch. "Low Hydrogen Electrodes," by Mr. Oldridge.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," by J. W. Bunting.

HOVE.—South Eastern Electricity Board, 10, Queen's Gardens, 6.30 p.m. I.E.E. Southern Centre. "Meter Problems and Consumers' Load Characteristics," by L. B. S. Golds and P. Schiller.

LONDON.—Savoy Place, 6.30 p.m. I.E.E. London Students' Section. "The Application of the Rotary Amplifier," by D. A. Alexander.

Savoy Place, 5.30 p.m. I.E.E. Radio Section. "Some Comparative Directional Measurements on Short Radio Waves over different Transmission Paths," by E. N. Bramley; "Some Aspects of the Rapid Directional Fluctuations of Short Radio Waves reflected at the Ionosphere," by E. N. Bramley; "On the Rapidity of Fluctuations in Continuous Wave Radio Bearings at High Frequencies," by Dr. W. C. Bain; and "Sources of Error in U-Adcock High-Frequency Direction Finding," by K. C. Bowen.

MIDDLESBROUGH.—Cleveland Scientific & Technical Institution, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "The Royal Festival Hall—Electrical Installation," by J. G. Hunter.

NEWCASTLE-UPON-TYNE.—Newe House, Pilgrim Street, 6.15 p.m. I.E.S. Newcastle Centre. "The Design and Application of Flameproof Lighting Equipment," by D. A. Strachan.

NOTTINGHAM.—Victoria Hotel. Incorporated Plant Engineers, East Midlands Branch. Annual dinner.

ROCHESTER.—Bull Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. Annual general meeting.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Developments in Thermionic Devices since 1939," by Dr. J. Thomson.

Thursday, 3rd March

CARDIFF.—S. Wales Electricity Board, The Hayes, 5.45 p.m. I.E.S. Cardiff Centre. "The Architect's Approach to Artificial Lighting," by J. D. Layton.

CHELMSFORD.—Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Peace-time Use of Atomic Energy," by L. A. Rotherham.

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. "Industrial X-Rays," by F. L. Veale.

GLASGOW.—39, Elmbank Crescent, 7.30 p.m. I.E.S. Glasgow Centre. "Flicker in Relation to Fluorescent Lighting," by R. G. Hopkinson.

LIVERPOOL.—College of Technology, Byrom Street, 7 p.m. British Institution of Radio Engineers, Merseyside Section. Symposium on "Electronics in Industry."

LONDON.—Savoy Place, 5.30 p.m. Institution of Electrical Engineers. "The Electrical Engineering Industry in the Post-War Economy—II," by G. L. E. Metz.

MANCHESTER.—College of Technology, Sackville Street, 7 p.m. British Institution of Radio Engineers, North-Western Section. "Computing Circuits in Flight Simulators," by Dr. A. E. Cutler.

NOTTINGHAM.—E.M.E.B., Smithy Row, 6 p.m. I.E.S. Nottingham Centre. "Colour and Colour Vision," by W. D. Wright.

PETERBOROUGH.—Campbell Hotel, Bridge Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. "Space Heating," by G. A. Rooley.

SOUTHAMPTON.—Polygon Hotel, 7.30 p.m. Incorporated Plant Engineers, Southampton Branch. Annual general meeting.

Friday, 4th March

BATH.—Angel Hotel, 8 p.m. A.S.E.E. Bristol & West of England Branch. Film show.

BELFAST.—Belfast Association of Engineers. Dinner-dance.

BIRMINGHAM.—Grand Hotel, 7 for 7.30 p.m. Birmingham Electric Club. Jubilee ladies' evening.

EDINBURGH.—Caledonian Hotel. I.E.E. Scottish Centre. Dinner.

Roxburghe Hotel. Incorporated Plant Engineers, Edinburgh Branch. Annual dinner and ladies' evening.

LIVERPOOL.—At the Liverpool Engineering Society, 9, The Temple, 24, Dale Street, 7.30 p.m. A.S.E.E. Liverpool Branch. "Earth Leakage Circuit Breakers," by Mr. Hoban.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. "Electronic Aids to Production," by N. W. S. Ingles.

NOTTINGHAM.—Victoria Station Hotel. I.E.E. East Midland Centre. Annual dinner.

PORT SUNLIGHT.—Hulme Hall, 7 p.m. I.E.E. Mersey & North Wales Centre. Dinner-dance.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North West London Branch. Branch lecturettes.

Saturday, 5th March

DUNDEE.—Mathers Hotel. Incorporated Plant Engineers, Dundee Branch. Annual dinner and dance.

New Zealand Imports

Imports of electrical machinery and apparatus into New Zealand during the first half of last year were slightly greater in value than those in January-June, 1953. The accompanying table gives the values of the chief groups, totalling £5,330,000. The radio trade showed progress and there was a big increase in imports of vacuum cleaners. On the other hand business in telegraph and telephone apparatus declined.

Class of Equipment	Jan.-June 1954 £ (000)	Inc.or dec. on Jan.-June 1953 £ (000)
Batteries and cells	61	+ 6
Electrodes and carbons ...	33	+ 6
Generators and magnetos ...	318	+ 8
Insulating cables and wire ...	889	− 5
Insulators and parts	100	+ 37
Lamp bulbs	59	− 2
Lamps (not surgical)	263	+ 93
Motors under 1 h.p.	251	− 23
Motors 1 to 25 h.p. (inclusive)	138	− 22
Motors exceeding 25 h.p. ...	28	− 50
Motor parts, starters, etc. ...	115	− 31
Razors, electric	147	+ 82
Telegraph and telephone apparatus (other than radio)	765	− 162
Transformers and convertors	431	+ 22
Other electrical apparatus ...	1,254	+ 272
Valves for receiving sets ...	57	+ 25
Other radio valves	22	+ 8
Other radio apparatus ...	235	+ 51
Vacuum cleaners	162	+ 119

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 30th March from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

30269. Standard Telephones & Cables, Ltd.—Electrical information storage circuits and electrical calculating circuits. 24th November, 1950. (727012.)

1950

10605. Licentia Patent Verwaltungs Ges. —Alternating current welding apparatus. 29th April, 1950. (727311.)

19304. Siemens Electric Lamps & Supplies, Ltd., Doherty, M. T., and Sergeant, G.—Fluorescent lamps. 27th July, 1951. (727392.)

1951

3818. Standard Telephones & Cables, Ltd.—Electron discharge device for visually indicating voltages. 16th February, 1951. (727133.)

5473. Mullard Radio Valve Co., Ltd.— Electrical counting apparatus. 6th March, 1952. (727134.)

12138. National Research Development Corporation.—Electrical self-balancing instruments. 23rd June, 1952. (727400.)

17193. Cossor, Ltd., A. C.—Adjusting knobs for electrical components. 8th July, 1952. (727402.)

19012. Morphy-Richards, Ltd.—Current sensitive switches and electric irons embodying such switches. 13th November, 1952. (727022.)

22516. Metropolitan-Vickers Electrical Co., Ltd.—Electric control systems. 23rd September, 1952. (727320.)

29757. General Electric Co., Ltd., McKeag, A. H., and Welsh, E. E.—Combinations of cathode-ray tubes with optical filters. 18th December, 1952. (727140.)

1952

5371. Standard Telephones & Cables, Ltd.—Stepping arrangement using two-terminal electrical trigger devices. 29th February, 1952. (727415.)

9182. English Electric Co., Ltd.—Electric fuses. 27th March, 1953. (727250.)

9250. Mager, S.—Electronic tube oscillator circuit particularly for acoustic devices. 10th April, 1952. (727040.)

9755. Courtney, J.—Electrical control systems and control devices therefor. 20th April, 1953. (727154.)

10456. Standard Telephones & Cables, Ltd.—Electric devices employing semi-conductors. 17th April, 1953. (727252.)

11296. British Thomson-Houston Co., Ltd.—Apparatus for tipping-off sealed envelopes of electric lamps and the like. 5th May, 1952. (727044.)

11782. English Electric Co., Ltd.—Geared motor units. 8th May, 1953. (727325.)

13833. Associated Electrical Industries, Ltd.—Fluid-blast electric circuit breakers. 13th May, 1953. (727258.)

14568. Rotax, Ltd.—Electric delayed-action switches. 5th June, 1953. (727260.)

17208. Hazeltine Corporation. — Colour television signal translating apparatus. 8th July, 1952. (727161.)

17503. Cinema-Television, Ltd.—Television receivers. 10th July, 1953. (727052.)

17561. Standard Telephones & Cables, Ltd.—Wrap-around assembly for electrical components. 11th July, 1952. (727053.)

18501. British Thomson-Houston Co., Ltd.—Operation of dynamo-electric machines. 13th May, 1953. (727059.)

18506. Scribbans-Kemp, Ltd., and Hendon, A. L.—Electrical weighing. 21st October, 1953. (727164.)

21501. Campbell & Isherwood, Ltd., and Rawlinson, R.—Brush-holders for electricity generators, electric motors and other electrical apparatus. 25th September, 1953. (727427.)

24050. Bosch Ges., R.—Electric batteries. 25th September, 1952. (727429.)

27050. Westinghouse Electric International Co.—Electric circuit interrupters, having arc extinguishing arrangements. 28th October, 1952. (727432.)

29801. British Thomson-Houston Co., Ltd.—Speed regulating systems for a.c. motors. 16th November, 1953. (727076.)

30821. Crompton Parkinson, Ltd.—Frequency measuring instruments. 24th November, 1953. (727434.)

31837. Bristol Co.—Electrical impulse producing apparatus. 16th December, 1952. (727284.)

33116. Bühler, W. (trading as Bühler, E.) —Electric heating devices. 31st December, 1952. (727346.)

1953

274. Patelhold Patentverwertungs & Elektro-Holding Akt.-Ges. — Change-over switch for connecting individual transmitters with individual antennæ. 5th January, 1953. (727081.)

1757. Speer Carbon Co.—Electrical connections to electrically conducting carbon. 21st January, 1953. (727349.)

2358. General Electric Co., Ltd., and Stenning, L. C.—Electric pulse generators. 10th December, 1953. (727439.)

3343. Eichler, H. G.—Electric battery connectors. 6th February, 1953. (727351.)

3668. Revo Electric Co., Ltd.—Lamps or lanterns primarily intended for highway lighting. 10th February, 1954. (727352.)

5882. General Electric Co.—Electric protective devices. 3rd March, 1953. (727197.)

11306. Courtney, J.—Electrical control systems especially for railcars having internal-combustion engines. 20th April, 1953. (727205.)

12911. Standard Telephones & Cables, Ltd.—Apparatus for extruding a plastic sheath around an electrical conductor. 8th May, 1953. (727104.)

14491. Philips Electrical Industries, Ltd. —Circuits for frequency modulating stabilized high frequency oscillators. 22nd May, 1953. (727368.)

15191. General Electric Co.—Dynamo-electric machines. 1st June, 1953. (727110.)

15441. Scintilla, Ltd.—Electric contact-breaker devices. 4th June, 1953. (727369.)

16159. Rotterdam, Gemeente.—Electric cable branch terminals. 11th June, 1953. (727111.)

16727. Emag Elektrizitats-Ges.—Mechanical rectifiers. 17th June, 1953. (727370.)

17651. British Thomson-Houston Co., Ltd.—Operation of dynamo-electric machines. 25th June, 1953. Addition to 727059. (727299.)

18498. General Electric Co.—Insulated electrical conductors. 3rd July, 1953. (727373.)

19789. Electrol, Inc.—Control valve assemblies. 16th July, 1953. (727120.)

21037. General Electric Co.—Cord storage reels for suction cleaners and the like. 29th July, 1953. (727375.)

22625. Garnerot & Co. (Consolidated Agencies), Ltd.—Electrical junction boxes. 17th August, 1953. (727220.) 22875. Electrical plug connectors. 19th August, 1953. (727378.)

22892. Didier Kogag Hinselmann Koks-Fenbau und Gasverwertung Akt.-Ges.— Apparatus for washing gas. 19th August, 1953. (727379.)

23109. Garnerot & Co. (Consolidated Agencies), Ltd. (Wago-Klemnenwerk Ges.)— Means for detachably securing leads to electrical connecting devices. 21st August, 1953. (727380.)

25188. Philips Electrical Industries.— Sound reproducing devices. 11th September, 1953. (727458.)

25948. Kundert, A.—Refrigerating plant. 21st September, 1953. (727222.)

30967. General Electric Co.—Electrical temperature detector units. 9th November, 1953. (727228.)

32760. Soc. des Piles Wonder.—Flat electric dry cell elements to be associated in parallel and assembling of these elements into a battery. 25th November, 1953. (727309.)

33666. General Electric Co.—Measuring apparatus including means producing magnetic bias fields and alternating electro-magnetic fields. 3rd December, 1953. (727129.)

36371. Felten & Guilleaume Carlswerk Akt.-Ges.—Electric high-tension cable. 31st December, 1953. (727130.)

1954

5715. Licentia Patent-Verwaltungs Ges. —Method of making electrical and/or mechanical connections. 1st September, 1952. (727460.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 2nd March:—

ANCHOR. No. 734,771, Class 7. Electric washing machines.—Anchor Investment Co., Ltd., 54, Bridge Street, Manchester.

DEBER (design). No. 726,746, Class 9. Electrical apparatus and instruments.—Dag Sigurdsson Schreiber, Lidingo, Sweden. Address for service, c/o William A. Shepherd & Son, 54, Brown Street, Manchester, 2.

WELSTAT. No. 731,907, Class 9. Electrical resistances.—Welwyn Electrical Laboratories, Ltd., Trading Estate, Bedlington Station, Northumberland.

REDDIVISION. No. B734,933, Class 9. Instruments, apparatus and parts for the production, transmission, reception, amplification, detection, distribution, recording, reproduction, control, measurement or indication of carrier wave, telegraphic, telephonic, television or acoustic frequency signals or for direction finding.—Central Rediffusion Services, Ltd., Carlton House, Lower Regent Street, London, S.W.1.

WESCULITE. No. 736,375, Class 9. Oil-immersed metal electric current rectifiers.—Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.

PRINCESSA. No. 737,093, Class 9. Radio, television and telegraphic instruments and apparatus, gramophones, and parts; electric batteries; and cases for electric torches or for electric pocket lamps.—Vidor, Ltd., West Street, Erith, Kent.

KEDAFON. No. 737,139, Class 9. Telephonic apparatus.—Fonadek (Branson), Ltd., Knightsdowne House, Vivian Road, Harborne, Birmingham, 17.

CREDA CAREFREE. No. 736,473, Class 11. Electric cooking stoves and electric water heaters and parts.—Simplex Electric Co., Ltd., Broadwell, Oldbury, nr. Birmingham.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—31st March. Hydro-Electric Commission, Box No. 631B, G.P.O., Hobart, Tasmania. Electrically-driven pumping plant. (E.S.B. 3593/55. Ten/12647.)*

31st March. Sydney County Council. Twelve portable recording ammeters. (E.S.B. 3101/55. Ten/12569.)*

Belfast.—3rd March. Re-wiring of Ulsterville Primary School, Edinburgh Street, and installation of electrical heating in Sandy Row Primary School, Hurst Street. Education Architect's Department, 40, Academy Street.

Edinburgh.—North of Scotland Hydro-Electric Board. Erection of overhead lines, Grudie Bridge/Kyle of Lochalsh reinforcement. (See this issue.)

Formosa.—14th March. Central Trust of China, U.S. Aid Division, Taipei. Supply of 4,400 boxes, 900,000 separators and 27,600 cell covers for storage batteries. (E.S.B. 2203/55. Ten/12612.)*

Hendon.—8th March. Borough Council. Supply of electrical fittings for one year. Borough surveyor, Town Hall, N.W.4.

India.—16th March. Madhya Pradesh Electricity Board (Project 2). 11 kV oil circuit breakers. (E.S.B. 3650/55. Ten/12671.)* 22nd March. (Project 1). Power transformers. (E.S.B. 3127/55. Ten/12646.)*

24th March. Electrical Department, Damodar Valley Corporation, Calcutta. 132 kV and 33 kV suspension and pedestal insulators and hardware. (E.S.B. 3126/55. Ten/12602.)*

10th April. Director General of Supplies and Disposals, Shahjahan Road, New Delhi. 11 kV and 66 kV switchgear, transformers, cables, etc., for external electrification of Bharat electronic factory at Jalahali (Bangalore). (E.S.B. 3157/55. Ten/12594.)*

Kuwait.—25th April. Government Department of Electricity. Transformers for power station. (See this issue.)

Manchester.—25th March. Corporation Waterworks Committee. Service and telephone cables. (See this issue.)

Newcastle-on-Tyne.—2nd March. City Council. Electrical repair and maintenance work in Council houses for one year. Housing manager, 19, Dean Street.

New Zealand.—19th April. Director General, Stores Division, G.P.O., Wellington. Two frequency oscillator units. (E.S.B. 3136/55. Ten/12583.)*

Newry (Co. Armagh).—2nd March. R.D.C. and County Health and Welfare Committees. Electrical installations in new joint offices, Monaghan Row. Clerk of Council, R.D.C. Offices, Daisy Hill.

Pakistan.—9th March. Pakistan Posts and Telegraph Department. Voice frequency telegraph equipment. (E.S.B. 2719/55. Ten/12543.)*

Philippines.—15th April. National Power Corporation, Manila. Two hydraulic turbines, governors and inlet valves and one power transformer. (E.S.B. 3461/55. Ten/12645.)*

Reading.—16th March. Borough Council. Electric wiring in houses (546). (See this issue.)

Romford.—15th March. Borough Council. Electrical installations in flats (198). (See this issue.)

Scunthorpe.—16th March. Borough Council. Street lighting equipment. (See this issue.)

South Africa.—17th March. Union Tender and Supplies Board. Electronic counter and digital recorders. (E.S.B. 3020/55. Ten/12587.)*

Uruguay.—8th March. Administracion General de las Usinas Electricas y los Telefonos del Estado. Three high power transformers. (E.S.B. 2649/55. Ten/12572.)*

14th April. Administracion Nacional de Combustibles Alcohol y Portland, Casilla de Correo 1090, Montevideo. Two hundred electrical petrol pumps for 220 V single-phase 50 c/s. (E.S.B. 3150/55. Ten/12604.)*

Walsall.—12th March. Borough Baths Department. Re-wiring of Bloxwich Baths. Baths superintendent, Baths Department, Tower Street.

Wandsworth.—6th April. Borough Council. Street lighting equipment. (See this issue.)

Wigan.—21st March. Borough Council. Street lighting equipment. (See this issue.)

* Specifications may be inspected at the Export Services Branch Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Bradford.—Corporation. Electric goods-passenger lift at 55, Leeds Road (£1,372).—Electro-Lifts, Ltd.

Bredbury and Romiley.—U.D.C. 140 W sodium street lighting along Ashton Road, A.6017 and Lingard Lane.—Cohen Bros. (Electrical).

Carlisle.—Highways and Streets Committee. Recommended. Improved lighting in various streets (£9,623).—Tele-Electric Services.

Chertsey.—U.D.C. Installation of Group "A" mercury vapour street lighting in Eastworth and Chertsey Road (£4,319).—General Electric Co., Ltd.

Hertfordshire.—County Council. Electrical installation at Cole Green New Secondary Modern School, Welwyn (£7,100).—A. Tindall & Sons, Enfield.

Ilfracombe.—U.D.C. Sodium and fluorescent lighting installations (145 columns), in various roads.—Cohen Bros. (Electrical).

Middlesbrough.—Town Council. Electrical installation in old people's hostel, Thorntree (£2,589).—Horne & Co.

Nelson.—Corporation. Recommended. Electrical installations in 36 houses in course of erection at the Marsden Park housing estate (£908).—J. Young.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashford (Kent).—Grammar school for boys (£110,000); county architect, Springfield, Maidstone.

Barking.—Two nine-storey blocks of 48 flats each, Thames View estate; borough architect.

Birmingham.—Retail store (£300,000), High Street; Littlewoods Mail Order Stores, Ltd., 152a, London Road, Liverpool.

Boreham Wood.—Milk distribution depot and offices; A1 Dairies, Ltd., Oakmere Farm, Potters Bar.

Bristol.—Houses (172), with 11 shops, as further stage of Redcliffe development scheme; city architect, Eagle House, Colston Avenue, 1.

Cambridge.—Additions and alterations to Papworth Sanatorium (£100,000); Adams, Holden & Pearson, architects, 38, Gordon Square, London, W.C.1.

Canvey Island.—Houses (200), shops and garages, for East Ham Town Council; H. A. Edwards, town clerk, Town Hall, London, E.6.

Cardiff.—Home for the aged (£57,000); city engineer, City Hall, Cathays Park.

Chartham (Kent).—Secondary school (£88,250), for Education Committee; county architect, Springfield, Maidstone.

Chatham.—Crematorium for boroughs of Chatham, Gillingham and Rochester; Sir Guy Dawber, Fox & Robinson, architects, 122, Wigmore Street, London, W.1.

Chesterfield.—Extensions and remodelling of College of Technology (£160,000), for Derbyshire Education Committee; county architect, County Offices, St. Mary's Gate, Derby.

Town Council to build 182 houses at Pevensey, 88 at Whittington and 30 at Newbold; borough architect, Scunthorpe.

Croydon.—Technical college and school of art (£303,160); E. Taberner, town clerk, Town Hall.

Darlington.—Bus station with all amenities at Feethams, and new municipal buildings and offices; borough architect.

Dover.—Houses (34), shops, showrooms, etc., Stembrook; borough surveyor, Brook House, Maison Dieu Road.

Dudley.—Dwellings (120), Woodside; borough architect.

Eccles.—Factory at Barton Lane for W. C. Jones, Ltd.; Harry S. Fairhurst & Son, architects, 55, Brown Street, Manchester.

Eston.—Factory and offices on 10 acres site at South Bank; British Oxygen Co., Ltd., Bridgewater House, Cleveland Row, London, S.W.1.

Glasgow.—Houses (104), Simshill area; Mactaggart & Mickel, Ltd., 107, West Regent Street.

Five-storey extension to Pathology and Bacteriology Department of Western Infirmary; Western Regional Hospital Board, 64, Bath Street.

Great Yarmouth.—High school for girls (£156,630); borough surveyor, 15, Regent Street.

Guildford.—Civic hall (£150,000); G. H. Cousey, borough surveyor, Municipal Offices, High Street.

Hartlepool.—Proposed cinema, West View; R. H. Bailey, Yarm.

Hastings. — Factory, Theaklen Drive; Knightshades, Ltd., Derby Road, London, N.18.

Hatfield.—Hospital to serve Hatfield and Welwyn Garden City New Towns; N.W. Metropolitan Regional Hospital Board, 11, Portland Place, London, W.1.

Hexham.—Police headquarters; county architect, Newcastle-on-Tyne.

Hull.—Works, Stoneferry industrial estate; Kettlewell, Sons & Co., Ltd., 11/12 Colonial Street.

Jarrow (Co. Durham.)—Cinema near the Robin Hood Inn for Dawe Brothers, Westgate Road, Newcastle-on-Tyne.

Houses (391), Queen's Road area (£800,000), and shops (103); borough engineer.

Kettering.—Proposed erection of new cattle market; borough engineer.

Kidderminster.—Proposed North County Secondary School: F. Gibberd, architect, 8, Percy Street, London, W.1.

Leicester.—Secondary school in Anstey Lane for City Council (£141,160); city architect.

London.—Additional wing (£500,000) to Royal Masonic Hospital, Hammersmith; Royal Masonic Society, Great Queen Street, W.C.2.

Longbenton.—Flats (852); city architect, Newcastle-on-Tyne.

Ludlow.—Houses (300), in the Sheet Road estate; town clerk, Dinham Lodge.

Manchester.—New science block at North Manchester Grammar School, Chain Bar; city architect, P.O. Box 488, Town Hall.

Works and offices, Flats Road, Roundthorne; Geigy Pharmaceutical Laboratories, Ltd., Rhodes, Middleton.

March.—Clinic for Isle of Ely County Council (£6,500); county architect, March, Cambs.

Middlesbrough.—Additions to the college of art for the Education Committee (£42,000); K. J. Caton, education architect.

Newcastle-on-Tyne. — Primary school, Halewood Avenue; city architect, 18, Cloth Market.

Newport (Isle of Wight).—Stores, offices and fitting shop, Chapel Street; Hedley Simpson, Ltd., 81, Upper James Street.

Norfolk.—Secondary modern schools at Fakenham (£183,920), Methwold (£130,900), and Sheringham (£124,900); F. L. Ralphs, chief education officer, Stracey Road, Norwich.

Northumberland.—Civil defence training centre at Southgate, Morpeth (£102,000) and children's home, Bedlington; C. C. Brown, county architect, Newcastle-on-Tyne.

Ormskirk.—Extension of County Mental Hospital; Liverpool Regional Hospital Board, 88, Church Street, Liverpool.

Sheffield.—Six-storey blocks of maisonnettes at the Gleadless Valley estate; city architect.

Staffordshire.—Six county secondary modern schools at Hixon, Rocester, Waterhouses, Warslow, Barton-under-Needwood and Penkridge; J. F. Parker Oxspring, director of education, Stafford.

Stamford.—Third storey for Nurses' Home (£12,000) and new laundry and alterations to main kitchen in Stamford and Rutland Hospital; Lenton & Partners, Broad Street.

Stockton-on-Tees.—Bus station (£30,000), and houses (200), at Fairfield; borough architect, 28, The Square.

Sutton (Surrey).—Developments at Belmont Hospital, including new nurses' accommodation (£77,000) for South West Metropolitan Regional Hospital Board; architect to the Board, 76, Wimpole Street, London, W.1.

Swadlincote.—R.C. church; Harrison & Cox, architects, 49, Frederick Road, Edgbaston, Birmingham.

Thatcham.—Additional paper mill; Colthrop Board & Paper Mills, Ltd., Colthrop Mills.

Tottenham.—Houses (301), on Potters Bar housing site; borough engineer, Town Hall, London, N.15.

Treliske (Cornwall).—New general hospital proposed (£1,000,000), for South West Regional Hospital Board; Adams, Holden and Pearson, architects, 38, Gordon Square, London, W.C.1.

Warrington.—Boys' and girls' secondary modern schools at Orford; borough surveyor, Town Hall.

Proposed branch library, Poplars Avenue and Capesthorne Road; borough engineer.

Wayland (Norfolk).—Council offices for R.D.C.; surveyor, Council Offices, Attleborough.

West Hartlepool.—Assembly hall, café, etc., at Seaton Carew (£56,000) and two blocks of flatlets for Corporation Welfare Committee; borough architect, Municipal Buildings.

Wigan.—Houses (160), Sherwood Drive; borough surveyor.

Foster Mobile Exhibition

Last week we had the opportunity of inspecting at their South Wimbledon works the new mobile exhibition vehicle of Foster Transformers, Ltd. The intention is to operate the exhibition as a sales adjunct to the company's various area branch offices and to their technical sales engineers.

When touring the country it is hoped to show the products to personnel of the British Electricity Authority, Electricity Boards and industrial organizations who are normally unable to visit the factory. It is proposed that the equipment carried shall be capable of practical demonstration and, if necessary, be actually employed at a potential customer's works.

The vehicle houses complete control facilities for either a single-phase main supply or, when situated in remote areas, a 1¼ kW mobile diesel alternator set is used to provide the necessary supply. This set is normally carried in the vehicle while travelling; loading on and off is by means of ramps. Among other facilities are main incoming metalclad sockets, auto-transformer for compensating for mains variations and dual circuit switchboard for either mains or diesel supply, each circuit having its own protective circuit breakers. A kWh meter is installed to meter mains supplies consumed and all outgoing circuits are fused at the switchboard. Ring main circuits installed above the demonstration benches and at points on the floor allow adequate access to mains supply.

Cold cathode lighting is installed and this is operated from a 6 kV 135 mA transformer. Tubular heaters are installed but when in transit the interior is heated from the engine. The vehicle is equipped with an office desk and washing facilities are provided by a sink and watertank beneath one of the seating benches.

The driver's cab is heated and provision is made for him to inspect the interior of the vehicle by means of bulkhead lights controlled from either the cab or main doorway. Cable storage, tool box benches, etc., are accommodated in a rear compartment. The vehicle, which measures 27ft 6in overall by 7ft 6in wide, is mounted on an A.E.C. chassis powered by a 7·7 litre diesel engine. Coachwork is by the Express Motor & Body Works, Ltd.

The new Foster mobile exhibition and an interior view showing a representative range of the company's products